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ABSTRACT

This report is a study of how consumer interests would be affected by changes in the copyright laws governing photocopy and computer-based information. It examines the natures of copyright protection and consumer interest and, after a discussion of the information market in general, weighs copyright/consumer interest in the areas of photocopying, software, computer data bases, and computer-created works. The following recommendations for policy are made: (1) that no royalty charge be allowed on photocopying other than for resale; (2) that both copyrights, with authority to charge royalties, and non-disclosure contracts be available to independent software firms, but (3) that neither be available to large hardware manufacturers; (4) that copyrights be available both on information incorporated in data bases and on material disseminated from them, including "computer created" works; and (5) that the Federal Government explore means of assisting small copyright holders in protecting their copyrights. Data tables, graphs, and a bibliography are included. (Author/JD)

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AN ANALYSIS OF COMPUTER AND PHOTOCOPYING COPYRIGHT ISSUES FROM THE POINT OF VIEW OF THE GENERAL PUBLIC AND THE ULTIMATE CONSUMER

by

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Prepared for the

National Commission On New Technological Uses
Of Copyrighted Works

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EXECUTIVE SUMMARY:

THE CONSUMER INTEREST IN APPLYING COPYRIGHT PROTECTION TO COMPUTER-BASED INFORMATION AND PHOTOCOPYING

THE EXPERIMENT

Public Interest Economics Center (PIE-C) and Public Interest Satellite Associates (PISA) are participating in a unique experiment in providing a federal agency with informed consumer input. The issue is how would consumer interests be affected by changes in the copyright laws governing photocopying and computer based information.

In 1974, Congress, recognizing that new forms of communication or information transfer, rapidly gaining in importance, might not fit neatly into the existing system of exclusive rights, created the National Commission of New Technological Uses of Copyrighted Works (CONTU). The Commission is charged with investigating what changes in copyright law may be necessary to "assure...access to copyrighted works and to provide recognition of the rights of copyright owners" in regard to the reproduction and use of copyrighted works, and the possible creation of new copyrightable items, by means of:

- automatic data processing systems, and
- machine reproduction.

For present purposes, this means:

- photocopying of copyrighted periodicals and books,
- use of computer programs or, more generally, computer "software",
- use and dissemination of copyrighted materials in computer data bases, and
- possible protection for new works of authorship created with the aid of computers.

By December 31, 1977, CONTU is required to submit to Congress a report, including recommendations for legislative and administrative action.

PIE-C is preparing, under contract, an analysis of the impacts of changes in copyright laws in these areas of new technology. The project has two purposes: to provide the basis for PIE-C testimony to the Commission in support of the public (or consumer) interest and perhaps, more far reaching, to provide other public interest groups with information that will help them formulate and present their positions on the issue. To reinforce the effort to provide opportunity for informed public interest participation, CONTU has also contracted with PISA to do three major things: to reach out to and inform public interest organizations

about CONTU's issues, to organize conferences among such groups to discuss the issues and to criticize drafts of the PIE-C report, and third, to present testimony of its own on the public interest aspects of CONTU's policy choices.

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A. INTRODUCTION

Article I, Section 8 of the United States Constitution states:

"The Congress shall have the Power...to promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries."

Under this authority Congress, early in United States history, established the copyright and patent systems, giving forms of exclusive rights to authors and inventors.

The copyright laws now in effect date from 1909. Over the years subsequent to 1909, the copyright system was expanded to incorporate several new forms, or uses, of creative works which were deemed to be eligible for protection as equivalent to more traditional "Writings" of authors. For example, copyright royalty fees are paid for the use of musical broadcasts to the general public over the radio. Not until 1976 did Congress enact a major revision of the 1909 statute. Public Law 94-553, a "General Revision of Copyright Law," will go into effect on January 1, 1978. One product of that statute is The National Commission on New Technological Uses of Copyrighted Works (CONTU).

A copyright gives its holder exclusive rights to use or sell the item in question. The scope of a copyright may, in general, be said to extend only to the way in which ideas are expressed, or their form, not to the ideas themselves. That is, an infringement occurs where a second "writing" is done that uses the same or similar written expressions, but not where only the same general idea is used. For example, it has been said that the basic plots used in novels are relatively few in number; plots cannot be protected, and innumerable copyrighted books can be produced by varying the way in which plots are expressed. The term of copyright protection granted an individual is the life of the author plus fifty years; a copyright issued to a corporation is valid for seventy-five years.

Patents, on the other hand, give exclusive rights to use of ideas contained in inventions. To be patented ideas must be original, have commercial value, and be non-obvious advances over existing knowledge. Hence, patents are more difficult to obtain but confer much stronger protection than do copyrights.

Copyrights (like patents) are grants of limited monopoly. They permit their owners to impose conditions on reproducing a work or to prevent copies from being made at all. Generally this means exacting a royalty(fee), but even if payments are not required by the holders, protection can still be used to prevent unauthorized changes from being made in the material, using it without attribution, or using it for specific purposes, such as advertising.

It is our belief, based on the information available to us, that copyrights would be used very little to prevent dissemination of information altogether. The major commercial use would be to impose royalties to maximize the income of copyright holders. This same use would be important to some other holders. In addition, many holders, especially non-commercial holders, would prefer that their works be widely and freely distributed. To them, the major advantage of copyright protection would lie in controlling abuse of their work, obtaining recognition through attribution or similar benefit.

The basic question to which this report is addressed is whether the interests of consumers would be advanced by increasing or decreasing the stringency of present copyright law as it applies either to photoreproduction of copyrighted materials or to computer based materials.

A number of associated questions emerged in the discussions with public interest advocates:

- Should any royalty charge be permitted?
- Should any royalty charge be permitted only for particular uses or users?
- Closely related, several participants asked whether and some urged that not-for-profit organizations, individuals or public interest groups should be exempt from payment of royalties, under some sort of fair use doctrine?
- Should research or development paid for by the government be subject to copyright assignable to private parties?
- Should copyrights be available only to individuals, as distinct from corporations or government entities?
- Since an individual or small firm can not be expected realistically to be able to prevent infringement by large corporations what, if any, adjustments in copyright law should be made?
- Will technology overtake us?

B. PIE-C'S GENERAL CONCLUSIONS

The key questions relate to the power to charge royalties. The PIE-C analysis strongly suggests that the answer to those questions differs between the photocopying and the computer areas;

- o No royalty charge should be allowed on photocopying other than for resale,
- o Copyrights with authority to charge royalties, and non-disclosure contracts should both be available to independent software firms,
- o Neither should be available to large hardware manufacturers,
- o Copyrights should be available both on information incorporated in data bases and on material disseminated from them, including "computer created" works,
- o To make copyright protection effective for individuals, non-profit organizations and small business, the federal government should explore means of assisting small copyright holders in protecting their copyrights.

More detailed conclusions follow the discussions of the major areas of concern. But it is important to note that the main conclusions in the two areas are substantially different.

C. GENERAL ANALYSIS

To focus on the question of how the interest of consumers would be affected by increasing or decreasing the power of providers of information to charge royalties for use of photocopying copyrighted works or for use of computer-based information, it is necessary to define consumer, the consumers' role and interest and the analytic issues presented. PIE-C defines "consumer" to mean the ultimate consumer, i.e., the individual or households, not for example, commercial customers of computer software companies. Although all people are consumers, most people play other economic roles as well, for example, as workers, investors, savers. We are concerned with people not in those roles but only in their function as consumers of goods and services for their own use.

The only legitimate function of economic activity is to increase (relative to what it would otherwise be) the well-being of the members of society. This means basically the well-being of consumers and workers. Because all costs of producing goods and services must be borne, in the end, predominantly by consumers or workers, their well-being tends to increase as the efficiency of the economy increases. Efficiency in this statement must be broadly defined to include all costs. In addition, it is consumers who ultimately benefit from the availability of any new product that is, in fact, of value.

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The economy is becoming progressively more dependent on information; the production of information and its use in productive processes are expanding dramatically. This appears to be particularly true of computer-based information and of photocopied information, as well as of information for final consumption, such as entertainment and cultural "information." The consumers' interest lies in assuring that adequate amounts of information are produced and are made available for use, both in the present and in the future.

The institution of copyrights empowers providers of information to constrain its use. The justification for this governmentally-enforced system can be thought of as the holders' property "right" to his/her work, or as a necessary inducement to produce and disseminate intellectual creations which are of value to society. It is the latter which constitutes the economic rationale for providing copyright protection or other compensation for creativity.

In turn, the basis for granting monopoly in this area of the economy rests on a recognition that the products of intellectual work, which may be classified as "information", (where we are subsuming "entertainment" under information) constitute a special type of commodity. For most products (carrots, automobiles, etc.) the producers are able to exact a price from every user by maintaining physical control of the objects until payment is assured. However, once a piece of information exists in tangible form, it is physically possible to copy it without let or hindrance. Only if the producer of the information is provided with an enforceable property right, can it demand payment from all the beneficiaries who might copy it. This characteristic of intellectual work is referred to as "non-exclusivity" (the producer cannot exclude all users from obtaining the benefit it may provide) or "non-appropriability" (the producer cannot appropriate a share of the benefits obtained by every user). In the case of information, there is a second problem: a large portion of the price that is paid for the material is not due to the costs of producing <u>that copy</u> of the work, but to the original efforts of creating the information in the first place. As a result, once a copy of a piece of writing or programming, etc. has been made available to the public, it can be reproduced at far less cost than that required to create it in the first place.

The social significance of such a situation would be that to the extent that creativity and the dissemination of creative work is stimulated by the prospect of monetary reward, publishing and other information-production would tend to be curtailed below the optimal level--consumers would be provided with less information than they would be willing to pay for.

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For example, the price of a mass market mystery novel includes a per-volume royalty paid by the publisher to the author, as well as the costs of editing and the risks of market failure. Without the existence of copyright protection, a second publisher could reprint the same novel at a price lower than the first, reducing the author's return for his/her writing, and making it impossible for the publisher to recoup its total costs.

Within this general rationale for a copyright system, three basic issues appear to be relevant:

- To what degree (if any) does the supply of intellectual products respond to the monetary incentive of royalties?
- To the extent that the supply of information is dependent on royalties, there is a clear tradeoff--the greater the costs imposed on users of copyrighted material, the higher will be the returns to producers and the greater the supply of information. What return to creators will, over the long run, assure that the optimal amount of information will be made available? Higher prices to consumers will raise the cost of using existing information and, hence, reduce its effective availability, but lower prices will tend to reduce production of future information. To the extent that new research or other creative work is dependent on using existing information, the problem is made complex: higher royalties exert some pressures on the production of new information.
- Given that producers of information respond to monetary incentives, is a system of exclusive rights to reproduction the best means of providing these incentives?

Stated alternatively, the question is: would each potential extension of copyright power contribute more to consumer welfare by stimulating the production and dissemination of new information than it costs in terms of availability of the presently existing stock and in increasing the cost of creating more information for the future?

One unifying theme does seem to apply in examining the entire range of issues identified above: the basic concept of monopoly. In economic policy--certainly within any form of market system--there is always a presumption against the granting or extension of monopoly power: the burden of proof is on him who would see monopoly expanded. While all copyrights confer a monopoly on reproduction

of the specific item involved, the cost that such limited monopoly can impose on users of the material is restricted by the degree to which other, similar, sources of information can be substituted for any particular one. To use the example of mass-market novels again, for most of them the copyright confers little ability to charge a high price because there is substantial competition among them. There appear, in contrast, to be two primary categories in which substitution is low, permitting a high degree of marketpower.

- o Individual ability allows the author to create an outstanding work, for which there is great demand even at prices well above cost. The desirability of copyright protection in such cases depends on the degree to which such talented individuals respond to the prospect of large monetary gains.
- o A large corporation, or a few firms acting in collusion, have effective control over one of the information industries, or a specific market within an industry, allowing them to restrict output, thus raising prices and generating monopoly profits.

In such cases action of some form should be taken to break up the corporations or to control their monopoly.

We can say that increased copyright powers would serve the public (consumer) interest if:

- o the supply of information is less than is socially optimal and if more stringent copyright authority would increase the supply toward that optimum,
- o it were the most efficient way to do so,
- o royalty payments reflect the value of the product to its users, and
- o there are no significant barriers to entry into each information market in question.

The peculiar characteristic of non-appropriability strongly suggests that without copyright or other protection the supply of information would tend to be less than is socially optimal. Public subsidization of the production of information would tend, in the opposite direction, to make the amount of information produced exceed the optimum level as determined by the market. However, for purposes of analyzing the desirability of copyright protection, it seems appropriate to assume that public subsidization reflects an effort to raise the production of information above the market level to some politically determined, more general concept of a socially optimal level.

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Having greater freedom to impose royalties, producers of any kind of information could be expected to use it only if doing so would increase their revenues. In the absence of severe constraints on market entry, any increase in revenues above the current levels would increase the supply of information--unless producers were totally insensitive to monetary returns.

In light of the fact that the payers of royalties would, in all practical cases, appear to be those who intended to benefit from having a copy of the material, there is little chance (with an important exception in the case of photocopying) that the royalty could exceed the value (at the margin) to the customer on whom the burden fell.

For all these reasons it appears that there may be some justification for expanding the role of copyright. Several questions remain, however:

- To what extent are producers of the relevant form of information responsive to the prospects of monetary reward?
- Are there more efficient ways of achieving the same ends?
- Are there significant barriers to entry in the relevant markets?

The remainder of this summary discusses the specific conditions applicable to the areas of computer software, computer data bases, computer-created works and photocopying, and will present PIE-C's policy recommendations, while identifying some major unresolved questions.

D. COMPUTER SOFTWARE

Computer programming, or production of computer software, is a recent, but rapidly growing, form of information. While clearly possessing aspects of human expression, software constitutes a significant break with previous modes of communication that have heretofore come under copyright law. The instructions are primarily directed towards the mechanical operations of a machine, rather than directly to human users. As a result, programs can be considered "processes" which might well be eligible for patent protection.

While software may represent as much as one-half to three-quarters of total computer costs for computer users in the United States, the vast majority of software development is currently done in-house, by firms and other institutions for their own use, by their own employees. Copyright (or other) protection is largely irrelevant for such software used only internally.

Separately-purchased software "packages" are taking a rapidly growing share of the market. While the giant corporations which dominate the "hardware" (the actual computer) market--IBM, Burroughs, etc.--sell a substantial portion of total program packages, their positions are steadily being eroded by the "independent" software firms, and among the latter there is very little concentration, the largest firms having very small market shares. The overall structure of the software industry is, then, unclear, as the hardware firms have historically possessed monopolistic advantages but, due to substantial freedom of entry, are gradually losing their dominant share.

Unlike the production of written works, the production of computer software is not undertaken primarily by authors working independently but is done by employees of user or producer corporations. It appears certain, then, that the supply of separately purchased software is responsive to the prospects of monetary reward. However, copyright or patent protection is not the only method of providing such incentives.

The industry currently relies heavily on trade secrecy. One survey of independent software firms showed that the vast majority use some form of contractual licensing arrangements with their customers, by which the purchasers agree not to disclose the contents of software packages to other firms--"trade secrecy" contracts. About three-quarters of responding firms felt that such arrangements are "somewhat", or "completely" effective in protecting their software against unauthorized copying and use.

Copyrights on software have been available, by decision of the Register of Copyrights, since 1964. While a number of firms do file copyright notices on their program packages, it appears that this is done mostly as a precautionary measure without any real confidence that the copyright alone provides effective protection.

Very few instances were cited in which firms viewed the fear of inadequate protection as being a barrier to the development of programs representing a "significant level of innovation."

Available evidence on proprietary protection, along with the rapid growth of the industry, suggests, then, that methods for retaining control of software products are in most cases adequate to give firms the necessary incentive to produce. Major reasons for this appear to be that currently most packaged software is either custom-designed or appropriate only for a limited number of

customers, and that separately-purchased softwear constitutes only a very small percentage of total automatic data-processing (ADP) costs for computer-using firms (due to the predominance of in-house development and other internal personnel costs). Program purchasers simply do not find the potential savings worth the effort and risk of trying to obtain unauthorized copies rather than buying from the software provider;

The major questions in software protection are:

- Does the predominant system of licensing (trade secrecy) have inefficiencies which would be reduced or avoided by a statute making copyrights clearly available for software?
- If the above is done, should trade secrecy agreements be banned?
- Should patents, rather than or in addition to copyrights, be available for software?
- Is software a unique enough form of information to justify a new form of statutory protection designed specifically for it?

A number of arguments suggest that trade secrecy is less satisfactory--socially less efficient--than are copyrights. These include:

- arranging and enforcing contracts involves substantial "transaction costs", raising prices to purchasers and reducing the supply of software,
- maintenance of such contracts has "economies of scale," so that large producers can use them more effectively than can small ones, tending to create concentration within the industry,
- the need for maintenance of trade secrecy tends to steer producers away from general-purpose and mass-marketed software, towards specialized programs which face less risk of disclosure, and
- the term of protection is unregulated; thus, if contracts are effective, the term is unlimited.

While conclusive data are not available, there is no evidence to show that transaction costs are a significant fraction of industry costs, or that large firms have important advantages in enforcement. In fact, industry trends suggest just the opposite. Moreover, there is little reason for believing that copyrights, with the bringing of infringement suits still being the responsibility of their holders, would change matters noticeably.

Contractual licenses do indeed confer an unlimited term of protection. However, under copyright law, with a 75-year protection period for corporate products, the term is effectively unlimited anyway, since no piece of software is likely to be commercially valuable for anything approaching that many years.

Thus, for the kinds of software largely produced to date, consumers appear to have little interest in either the constriction or expansion of copyright protection. However, copyrights do seem to have a substantial advantage over trade secrecy for mass-marketed programs, which are beginning to emerge with major potential. Clearly firms selling large volumes of software over-the-counter could not enforce non-disclosure contracts. Copyrights, however, automatically provide important protection against unauthorized copying. An analogy with records and tapes sold at retail is appropriate. While a copyright does not prevent single copies from being made using home tape-recorders, it does greatly inhibit competing firms from reproducing and selling copyrighted works on a mass scale. The same would presumably be true for software. Hence, making copyrights clearly available for programs appears to be desirable.

Even with the availability of unambiguous copyright protection we do not find it desirable to ban all secrecy contracts. Independent software firms are likely to continue to find secrecy more effective than copyrights in a large proportion of cases. Again, given close competition among firms, it is in the interests of software buyers and ultimately of consumers that sellers have the option of using one or the other (or both) means of protection.

Software innovations do have characteristics which are essentially indistinguishable from those for which patents are traditionally granted, and the standard justification for patents--to stimulate the creation of new processes and inventions--would appear to apply here. However, without more extended analysis of the patent system as a whole, this alternative is best put to the side.

Software's dual traits as both a "writing" and a "process" for use by a machine have led to an argument that it should not come under the same law as forms of expression designed for direct human communication. An example of a possible new form of protection would be a middle ground between copyrights and patents, in which "ideas" would receive protection but there would be no ban on independent development of software containing a given idea. In practice it is questionable if determinations could be made wether an innovation had been developed independently or "stolen." Also trade secrecy does, in effect, protect ideas while not preventing other firms from developing the same ones on their own.

Our arguments supporting the availablity of both copyrights and contractual licensing are applicable only where monopoly power is absent. Only is that case could the increased revenues obtainable through such protection be expected to bring about the expansion in the supply of information that is the social objective of any form of protection of information. The major hardware manufacturers appear to have very substantial monopoly positions, and measures which would accelerate their displacement by independent producers should increase overall economic efficiency to the ultimate benefit of consumers.

Our recommendations for software are:

1. For independent software firms not in control of a substantial portion of the market, continued use of non-disclosure contracts should be allowed.
2. For these same firms, copyright availability should be formally enacted, probably under a separate title of the copyright law, but with the term of protection still equal to or longer than the expected commercial life of most software.
3. Research should be done to find methods of making copyright protection more effective (enforceable for small copyright holders.
4. Research should be undertaken immediately to ascertain the extent to which hardware manufactureres have monopoly power in the software industry or are likely to develop it.
5. Measures should be taken to eliminate the existence and danger of monopoly power in the software field. In decreasing order of desirability measures are:

a. denial of trade secrecy and copyrights to large hardware manufacturers.

b. statutorily forcing hardware manufacturers to spin off their software operations.

c. antitrust litigation to force hardware manufacturers to divest themselves of their software activities and to split up any (future?) software firms with market power.

d. compulsory licensing with regulation of prices, holding profits down to competitive levels.

E. COMPUTER DATA BASES AND COMPUTER-CREATED WORKS

Computer data bases are, in general, compilations of information ("data") taken from one or more written or observational sources and stored in (or prepared for storage in) a computer memory in a systematized way. The organization of the data within the computer is designed so that retrieval of particular categories of information desired by users is rapid and efficient. Data bases may be regarded as analogous to various well-known material sources such as bibliographic indexes, social science abstracts, and encyclopedias. The major advantages of computerized systems are that (1) through use of programmed instructions, the computer itself can search the files, at a great savings in time and manpower, and (2) the files can be rapidly and relatively cheaply updated or expanded.

Access to, or output from the computer take any of several different forms, including paper copies, microform, or on-line electronic access, the last of which is probably most common. Data bases may be roughly categorized into three classes: bibliographic, statistical, and specialized. Bibliographic bases contain citations or abstracts of professional or other technical literature in one or in a variety of fields. Statistical bases consist of masses of data, such as financial statistics, and usually have facilities for high speed access and sophisticated analysis and graphical display. Specialized bases exist for a wide variety of applications. Examples include real estate listings, airline schedules, books in print, technical tables, and information on business and consumer credit ratings.

On-line, general-purpose bases appear to be the most important and have the greatest potential for growth. The firms which operate on-line services are generally known as "wholesalers." The wholesalers provide computer facilities

and a distribution network, but for the most part do not compile information banks themselves. Rather, these are bought from data base "manufacturers" and from publishers of standard written reference works. Each computer data base may contain information from as many as 40 or 50 hard-copy data sources.

At present the general-purpose on-line market is highly concentrated, with two firms (Lockheed and SDC) controlling most of the market. However, entry into the market has occurred recently, and with that entry some prices reportedly fell markedly. That suggests that there were substantial monopoly rents going to the original "wholesalers" and indicates that there is at least some price competition now. However, there is no clear indication of whether it will persist or how effective it will be. Several data bases are only available from one company, leaving little room for competition.

Regarding the information sources, preliminary indications are that the degree of competition varies greatly depending on the field of information. In some cases, there are a number of firms vying to market data bases which have comparable content, while in others there is only one supplier. As has been discussed earlier, however, concentration in itself does not imply monopoly power if barriers to entry are low. Also, non-profit corporations such as professional societies may strive for maximum dissemination even if market power is present.

Publishers of journals, reference works and written data bases have available to them standard copyright protection against use of their materials by computer data base "wholesalers." Because computerized information vending is a highly visible, public business, and since the materials used are re-sold to the public, there is not at present much opportunity for computer firms to evade paying royalties to their sources or meeting any other conditions for use. Hence, at the stage of transfer from data base/written index to computer-information vendor there is apparently a well-functioning system for protecting the property interest of data suppliers. Typically the copyright holder receives a percentage royalty on the sales of the wholesaler.

On the output side there does not seem to be at present a major protection issue, largely because users of computerized data bases receive individually-tailored output, unsuitable for use by other potential customers. Any unauthorized transferral of output copies that might occur is also limited by the difficulty of locating other users who would want the same listings and arranging a transaction with them.

There may be some problem due to another computer operator paying for and obtaining virtually all of a data base, then reselling its contents without incurring the "wholesaler's" setup cost. This practice is again hampered by the necessarily public nature of marketing computer data bases, and so it is probably not possible to avoid paying fees for any large-scale resale.

In this area, then, present law appears to provide adequate protection for the holders of copyrights. However, to the extent that firms possess market power, and thus the ability to control prices, at any stage of the process, the ultimate customers of data-base services will suffer in the end, due to higher prices, reduced supply, and hindered responsiveness to consumer needs. For lack of more imaginative solutions, we return to the standard remedies for monopolistic practices.

Computer-created works may be regarded as output which has been transformed to such an extent within the computer that it constitutes an original piece of work, eligible for copyright. Its value may be dependent in part on one or more copyrighted information sources, the software used to manipulate the data, the hardware and data transmission facilities, and the skill of the retrieval operators. We see no policy difficulties here. The rights to any revenues resulting from the newly created work should be allocated by private contractual agreements. In the absence of any rights of the input owners, the owner of the computer operation would retain ownership of the output. If an individual programmer renting computer time, with no strings attached, created such a work, that person would be entitled to the copyright. Other arrangements would again be of concern only to the parties involved. There does not seem to be any reason why works created with the aid of a computer should not be provided with the same proprietary copyright protection as any other intellectual work. In no case does a computer alone "create"--there are always human authors.

Again, because production is largely a corporate activity, there is reason to believe that the supply of computer data bases and computer created works is responsive to pecuniary incentives. In this case there is no established alternative to copyrights. Further, there is little reason to expect that payers of royalties would pay more than the marginal value of the input or output. Consequently, our recommendations are:

1. Copyrights should be available for both the information inputs into and the outputs from computerized information systems and other uses of computers to aid creative work.

2. Empirical studies of the structure and functioning of the industry should be initiated, and continuous monitoring of changes should be performed.
3. Federal policies to reduce or prevent monopolistic tendencies--policies analogous to those suggested for computer hardware firms operating in the software market--should be undertaken.

F. PHOTOCOPYING

The CONTU mandate includes recommending legislative change with regard to copyright protection against machine reproduction. The PIE-C study was restricted to photocopying. The quantity of the use of photocopying and the extent to which it has permeated the society have increased tremendously in recent years as the per page costs of copying have fallen dramatically. While hard evidence on what is being reproduced is limited, the existing data suggest that most photocopying is done in public, university and commercial libraries, in research establishments and in business operations. CONTU's policy concern related only to reproduction of copyrighted materials. It appears that a very small fraction of copying is copying of copyrighted materials, most reproduction being either internal documents used by firms and other organizations, or letters, reports and publications which are not copyrighted.

The publishing industry has argued that photocopying should in general be subject to copyright restrictions and has begun to establish clearinghouse mechanisms to enforce and administer the charging of royalties on photocopying.

The basic question is whether making virtually all photocopying (exclusive of face-to-face educational use) subject to copyright restriction would efficiently assure that the supply of copyrighted works would be moved to or toward the socially optimal level. The imposition of additional royalties would (in the absence of monopoly power) tend to increase the supply of published works, by making that activity more remunerative. But is there any reason to think that in the absence of such policy the supply of published works (that are subject to a significant amount of photocopying) is or would be too small?

Because of the non-appropriability of information, the low and declining cost of photoreproduction could mean that the supply is less than optimal. To the extent that photocopying is done for resale or is a substitute for

the purchase of a book or journal, the publishers' product is appropriated without compensation. Further, it could be argued that free benefits from the existing publications are garnered by users of free library services including photocopying. This is the essential argument for restrictions on photocopying of copyrighted materials. The question is what does the evidence show. Unfortunately there is not nearly as much evidence as one would wish.

There is general agreement--but little hard evidence--that within libraries a high proportion of photocopying, by patrons and for interlibrary loans, is of scientific and professional technical--primarily academic--journals, and that a large part of the remainder is of small sections of academic or technical books. Other heavily-copied items would be expected to include high-priced financial publications. Under current circumstances there appears to be little reason for concern over the royalty revenues of authors. Most scientific and technical literature is written by individuals on academic or other salaries, for whom royalties constitute an insignificant portion of their incomes. Most academic journals pay little or no royalty to authors, and some even charge publication fees. Besides, many authors publish for other than pecuniary motives.

To the degree that photocopying is a substitute not for individual subscriptions, but for manual note-taking, as seems likely in a large proportion of cases, duplication can be said to reduce publishers' revenues below what they would have been without photocopying. To the extent that persons are demanding a photocopying service rather than a publishing service when they make a photocopy, a royalty would tend to contribute to misallocating resources, tending to encourage more than the optimal amount of publication of the journals in question. Funds are transferred from the photocopying users to publishers despite the fact that the photocopying service requires many inputs in addition to the copyrighted materials themselves and despite the fact that if the photocopying is not a substitute for purchase, it is performed at no cost to the publishers. The output of photocopying services would tend to be decreased, that of publication increased, resulting in a misallocation of resources.

Moreover, there is a mechanism by which publishers can, and do, appropriate part of the benefits of multiple library usage, in any form. That is the practice of price discrimination, by which libraries and other institutions are charged a higher subscription price than are individuals. Publishers realize that libraries, in the recognition that many periodicals are heavily used, are less likely to cancel a subscription due to a price increase than is an individual subscriber. How satisfactory a mechanism this is complicated by the nature of public libraries, as 1) their budgets, and ability to afford subscriptions, depend on governmental budget situations and the political process, and 2) paying a high subscription fee for, as an example, a weekly financial publication implies an income transfer from all taxpayers to one particular group of users.

General evidence on the state of the publishing industry as a whole does not support a claim that photocopying has caused the industry any substantial harm. In recent years sales have grown at a steady pace, and the stock market values of individual firms indicate that publishing remains a profitable field. Further, only a small fraction (about ten percent) of total sales of commercial publishers is through channels that would permit substantial non-educational photocopying--libraries in particular. Consequently there is no basis for any concern about the effect of unrestricted photocopying on the economic health of the publishing industry in general. It would be desirable to have evidence on the economic and financial position of professional journal publications but little is systematically available. However, the existence of many small journals which have a very small number of subscribers suggests that the possible loss of a few subscriptions due to photocopying is not likely to discourage publication of many journals or substantial curtailment of their scope or content.

As photocopying costs continue to decline it is likely that the incidence of copying will grow substantially and extend beyond scientific and technical journals to various other types of written materials. However publishers can be expected to maintain a technological advantage over consumers in photocopying in that their costs of printing an additional unit of a publication should always be lower than the costs to the consumer of photoreproducing it. But as this differential narrows, it may be

outweighed by 1) the absence of a royalty fee paid to the author due to making a photocopy, and 2) the low cost of copying only portions of printed works.

Should photocopying become as inexpensive as to be a widespread substitute for purchases of information materials, it could cause returns to some authors and publishers to fall to such an extent that the supply of information would be reduced below what is optimal from the standpoint of consumers. This problem does not appear to be significant now or in the immediate future. Should it become so one can count on the publisher interests to make the fact known through the political process and would, presumably, become evident in the quintenniel review of photocopying called for in the 1976 Act. It is important to note that copying of copyrighted materials in libraries constitutes only one portion of total library usage, all of which can be regarded as reducing publisher revenues by allowing multiple usage of publications. The arguments used for charging royalties on photocoping in libraries are in large part applicable to all use of free libraries.

Conclusion: Under current conditions

- o the narrow range of materials that are photocopied
- o the lack of evidence of impact on authors
- o the availability of the price discrimination mechanism
- o the general health of the publishing industry and lack of evidence of serious financial problems in the most directly parts of publishing
- o the danger of misallocation of resources

We conclude that the imposition of royalties on most photocopying is unjustified. In those cases where reproduction is done for resale, and can be presumed to have an impact on sales or subscriptions, royalties are more likely to have the socially desirable effect of enabling producers to cover their costs and, hence, to enter or continue in operation. Consequently it is appropriate that the fair use doctrine be extended to cover all photocopying other than for resale.

G. NEW TECHNOLOGIES

The bulk of the PIE-C analysis and the work of CONTU has been concerned with "new technological uses of copyrighted works," but has looked almost exclusively at the impacts of information transmission methods which have already come into major use. We have left aside consideration of the impacts of technological changes which can be expected to occur during the next few years, let alone over longer periods in the future.

It is reasonably clear that technological advances are currently causing and will continue to cause drastic reductions in the real cost of using machine reproduction, computers, and, possibly most important, telecommunications. Systems incorporating these three and possibly other elements have enormous potential to increase general public access to information sources greatly. Yet for this to occur completely different methods of providing compensation to information producers may be necessary, and attempts to retain the current forms of proprietary rights could severely retard progress in increasing information creation and dissemination.

At present the costs of searching out and obtaining desired information are very high, and growing. Given the tremendous volume of new information produced each year, for most people it is quite difficult to find those specific books, journals, and other information they want. Moreover, the high costs of distributing knowledge means that a high proportion of authors and researchers cannot get their work published, or published in a sufficiently accessible form that it receives appropriate attention.

Prices of mass-circulation magazines, technical journals, and books, particularly reference and scholarly works, are increasing rapidly. Expenses for public education, at all levels, which can in large part be regarded as costs of information transfer, are on the order of $100 billion a year. Large and growing governmental subsidies exist for public libraries, mailing privileges for books and magazines, and federally-funded research activities.

Copyright royalties appear to amount to no more than a few billion dollars a year, small in comparison to the total cost of the information system, yet they may play a disproportionately important role, partly because copyright stabilizes property rights and encourages specific modes of exchange and transmission of information.

Telecommunications and other technologies have the potential to revolutionize access to information by separating the intellectual content of information from the medium on which it has traditionally been carried. The dissemination of information can be greatly aided by reducing to a small fraction of current costs the expense of efficient and appropriate distribution, which tends to dominate the costs of production.

For example, the collection of books in the Library of Congress could be converted into electronic form using existing optical technology and transmitted for home consumption at very low cost via television, using either current towers and transmission stations or satellites.

Utilization of such possibilities may require compensation systems based on entirely different methods from the present collection per-unit at point of final purchase. The one major alternative currently in use, financing of television, radio and to some extent other media indirectly via advertising, is highly deficient in obvious ways. What is needed is systematic development of experimentation for organizing and financing the dissemination of information in ways which are as restrictive and as conducive to general access as possible.

H. SPECIFIC QUESTIONS

A number of the questions posed at the beginning of this summary have not been addressed directly.

We have concluded that copyright protection for photocopying should be available in the event of reproduction for resale and should be available for all computer-based information. Should the fair use doctrine be extended to exempt public interest groups from paying royalties on materials they copy (by photoprocesses or by some computer recovery mechanism)? In terms of economic efficiency, there is no general basis for making such exemption. However, social policy is based on more than efficiency considerations. It is social policy to grant some categories of not-for-profit organizations special advantages.

Further, there are, in economics, several bases for such treatment. First, the product of such organizations is believed to be of broad public value, greater than the value placed on it by the market.

Second, many such organizations are involved in redistribution of wealth in one manner or another, and market efficiency is not socially optimal unless the distribution of wealth is itself socially optimal--which is believed by many, including the authors--to be far from the case. Third, there is a more modern justification for subsidizing the generation of information from sources other than the established producer-oriented sources of much policy information. Theoretically there could be more efficient means of providing the assistance that is deemed socially desirable for such organizations. Practically, the only way to support them appears to be through instrumentalities such as providing special small advantages such as reduced postage rates. Consequently, there are good practical and theoretical arguments for such exemption, but there is no unbiased way that we know of determining whether the social gains would exceed the social cost of such exemption. Our judgement is that such exemption would be socially desirable and for administrative convenience should be extended to all 501(c)(3) corporations.

It would appear to be undesirable to restrict copyright ownership only to individuals. First, many creative activities are now carried on in corporations, with mutually reinforcing research and development teams: the contribution of individuals is indeterminate. Second, to deny individual copyright holders the opportunity to sell their rights to corporations would greatly reduce the value of copyrights to the individual owners.

The question of whether research and development funded by the federal government should be subject to copyrights assignable to private parties would require more analysis than was possible in our study.

To make copyright holders effectively equal under the law, some form of assistance to small business, individual and non-profit copyritht holders appears to be highly desirable. However, to determine the appropriate form and the practicality of any form lies beyond the scope of the study reported here.

Finally, will technology overtake us? Our recommendations pertain only to the present and clearly visible applications of existing technology. This is based first on our lack of clairvoyance

but also on the observations that private interests are amply capable of seeking protection when a demonstrable need for protection arises. On the other hand to remove protection for almost any vested interest has historically proven to be politically most difficult. Hence, it seems entirely appropriate to recommend no protection to cover future contingencies. Further, the 1976 Act provides for review of the technology of photocopying at five year intervals. We recommend not only that the review be extended to cover computer-based information but that there be a sunset provision: unless existing protection in both photocopying and computer-based information is justified every five years it should be discontinued.

CHAPTER I
INTRODUCTION

A. PURPOSE

This report has been prepared by the Public Interest Economics Center (PIE-C) in partial fulfillment of its contract with the Commission on New Technological Uses of Copyrighted Works (CONTU) to study the impact on consumers of increasing or decreasing the stringency with which owners' interest in computer-related and photo-reproducible information is protected by copyrights.

The basic purpose of earlier versions of this report was to provide background for discussion with and among consumer group leaders and other public interest advocates at conferences held in Washington on May 2 and June 13, 1977, under the direction of the Public Interest Satellite Association (PISA). Those versions and this final report were and are intended to provide public interest leaders with background information which would be valuable to them in preparing any testimony they elect to present to CONTU, to provide information specifically for PISA for such purposes, to provide information to the CONTU staff and to be the basis for testimony by PIE-C.

B. NATURE OF COPYRIGHT PROTECTION

The special characteristics of the markets for information and creativity (discussed in Chapter II) led (or at least contributed) to the patent and copyright systems. The two systems have historically served different purposes.

The patent system is designed to encourage invention by offering a grant of monopoly to the originator of an "idea"--a process, design, or other form of useful physical invention. To obtain a patent, one must show (in actuality, pay a fee for the U.S. Patent Office to determine) that the idea is original (never before patented), has commercial value, and is a non-obvious improvement to existing knowledge to an expert in the field. Once granted, a patent gives exclusive rights to the holder to produce or use (or to withhold or transfer the rights to produce or use) the innocation. Should

the same or a similar item be developed independently by someone else, no matter how soon afterwards, the later developer is prohibited from making any commercial use of the item. Whichever individual or firm first puts in the patent application will, assuming it is accepted, obtain exclusive rights to the invention. Thus, patents not only solve the problem of non-exclusivity, but they go much farther. They prevent anyone else from benefiting from research on exactly the same item, even if it had been proceeding simultaneously, and they allow the patent holder not only to obtain returns from his/her (or the firm's) own work but to have a monopoly on the entire market for the invention. It is clear that patents create great incentives for first development of an innovation, but that they also impose high costs on society.

Copyrights offer a much more restricted degree of protection than do patents. Applied to communications via print, audio, and television media (among others) copyrights give exclusive rights to the specific expression communicated, but give no rights to the ideas contained therein; and there is no prohibition against independent development of the same idea or substantially similar expressions. Thus, since most ideas, such as themes or plots for stories, can be expressed in innumerable ways, copyrights afford the holders a monopoly much less extensive than do patents.

The distinction between patent and copyright protection can also be described as the former protecting meaning while the latter protects form.[1] We have these associations:

patents: physical--invention--idea--meaning

copyrights: communication--expression--form

To the degree that the above are separable phenomena the patent and copyright systems can be analyzed separately. But in reality the two are intertwined. Copyrightable items may contain not only commercially saleable forms but also ideas which are original and valuable in themselves. While we are not able to deal extensively with this subject in the present paper, it does appear that as the advanced nations move towards becoming "information economies," in which communications of all forms compose an increasing share of national income, it will be of vital importance to clarify such distinctions. In Chapter IV on computer software, we make evident one area in which advancing technology may b[illegible]king the copyright vs. patent dichotomy unsatisfactory.

Specifically, copyright protection of anything creates a limited but long-lived monopoly, given typically to the producer of the material. It can be thought of as a confirmation of his/her property "right" in his/her creation or it can be thought of as an inducement to producers (of all sorts) to create and provide more new works. It is the latter that constitutes the economic justification for copyright protection or other compensation for creativity.

Copyrights permit the holder to impose conditions on copying or permit the holder to keep a work from being copied at all. The most obvious condition for reproduction is the payment of a royalty. But other conditions may be important as well. For example, a copyright provides some protection against making unauthorized changes in the material, or using it without attribution, using it for unauthorized purposes, such as advertising. The existence of a copyright does not imply or require that royalties be charged or that any other restriction on use be imposed; it merely permits such imposition. Obviously, all these kinds of protection have potential value to any copyright holder. For some the non-monetary aspects may be the most important, for those individuals and corporations whose income depends on receipts from producing copyrightable material, the royalty is likely to be the most important.

There is clearly a possibility of drawing a copyright statute that would provide some but not all these forms of protection. For example, the power to preclude copying of a product could be replaced by a requirement to license its use. One could also imagine a law which provided all forms of protection other than the collection of royalties. For reasons discussed below none of these options appear to be very significant in reality.

It is our belief, based on the information available to us, that copyrights would be used very little to prevent dissemination of information altogether. The major commercial use would be to impose royalties to maximize the income of copyright holders. This same use would be important to some other holders. In addition, many holders, especially noncommercial holders, would prefer that their works be widely and freely distributed. To them, the major advantage of copyright protection would lie in controlling abuse of their work, obtaining recognition through attribution or similar benefit.

It is possible that copyrights serve other ends. Because a copyright holder can prevent any (legal) dissemination of the copyrighted information, the copyright could be used to suppress information. It is a not uncommon practice to buy patents not to exploit them but to prevent their being exploited. We know of no way of systematically exploring whether such use of copyrights is substantial or is likely to become so with future technology.

C. QUESTIONS

The basic question to which this report is addressed is whether the interests of consumers would be advanced by increasing or decreasing the stringency of present copyright law as it applies either to photoreproduction of copyrighted materials or to computer based materials.

There are a number of associated questions that emerged in discussion with public interest representatives:

- Should any royalty charge be permitted?
- Should any royalty charge be permitted only for particular uses or users?
- Closely related, should not-for-profit organizations, individuals or public interest groups be exempt from royalties, under some form of fair use doctrine?
- Should research or development paid for by the government be subject to copyright assignable to private parties?
- Should copyrights be abailable only to individuals, as distinct from corporations or government entities?
- Since an individual or small firm can not be expected realistically to be able to prevent infringement by large corporations what, if any, adjustments in copyright law should be made?
- Will technology overtake us?

It is not within the purview of the study reported here to examine the question of whether copyrights are, per se, socially desirable. Although, if we had evidence that that they were not, we would have examined the cases studied in light of such evidence. Not only do we know of no such evidence, but we find some circumstances in which copyrights are clearly desirable.

D. THE NATURE OF CONSUMER INTEREST

1. Definition of Consumer

In order to address the question of how consumer interest would be affected by changes in copyright law, it is necessary to define consumer and to specify the nature of the interest of consumers as a group in copyrights.

To understand the relevance to consumer interests of the protection of innovation and production, whether in information or in physical products, it is essential to appreciate the key role of consumers in the economy. In welfare economics, the only legitimate function of economic activity is to increase (relative to what it would otherwise be) the well-being of the members of society. This means basically the welfare of consumers and workers. In light of the fact that all costs of producing the goods and services created in the economy must ultimately be borne predominantly, and perhaps exclusively, by consumers and workers, their well-being tends to increase as the efficiency of the economy increases. (Efficiency in this statement must be broadly defined to include all costs and the concept of output must be correspondingly broad.) In addition, it is consumers who ultimately benefit from the availability of any new product that is, in fact, of value.

Throughout this report we define consumers as the ultimate consumers (or households); not, for example, commercial customers using copyrighted information. Thus, we are defining consumers as people, natural persons. A problem of communication may arise from the fact that whereas all people are consumers, most people also play other economic roles, for example, as workers, investors, savers. We are concerned with people, not in those roles, but only in their role or function as consumers of goods and services for their own use.

Several alternative definitions might have been used (some of which were suggested by public interest advocates), including:

- o consumer representatives,
- o public interest groups,
- o non-profit organizations,
- o small business, and
- o customers.

The last of these is in common use in some simplified forms of economic analysis where it is necessary only to distinguish between the suppliers and demanders in

a market. However, many customers, particularly in commercial ADP (automatic data processing), are producers--businesses or government--using information just as they use any other input in their productive processes. As is well established in the public choice literature (and by casual observation), businesses and governmental entities typically are well represented in legislative and regulatory proceedings. It is our understanding that it is CONTU's interest to be presented with ideas as to the typically under-represented interests of the mass of people in their role as consumers. Hence, we do not consider all customers consumers.

With regard to the other possible definitions of consumer, two questions arise: are the various groups really "consumers" in some sense that is useful here? Is it socially desirable that they be granted preferential treatment under the fair use doctrine?

Consumer representatives could, of course, be thought of as surrogate consumers. Small businesses are clearly not performing the function of consumers, nor are non-profits in general or all public interest groups. Further, small business includes some amply represented producer groups such as physicians, attorneys, independent oil producers, and non-profits include many business-related organizations.

The question of whether any of these groups are entitled to some preferential treatment has to do with the question of exemption from royalty payment ("fair use" exemption) not with copyrights per se. In terms of economic efficiency, there is no general basis for making such exemption. However, social policy is based on more than efficiency considerations. It is social policy to grant some categories of not-for-profit organizations special advantages.

Further, there are, in economics, several bases for such treatment. First, the product of such organizations is believed to be of broad public value, greater than the value placed on it by the market. Second, many such organizations are involved in redistribution of wealth in one manner or another, and market efficiency is not socially optimal unless the distribution of wealth is itself socially optimal--which is believed by many, including the authors--to be far from the case. Third, there is a more modern justification for subsidizing the generation of information from sources other than the established producer-oriented sources of much policy information. The argument can be made

on the basis of the public choice literature, that genuine public interest representatives should be subsidized in the general interest. In brief, frequently, the actions that benefit the majority are disadvantageous to the interested small groups, but because of the concentration of impact the special interest groups have greater motive for making their voice heard in policy decisions. It can be shown that the provision of objective or countervailing information will tend to increase the quality of policy decisions under such circumstances.

Theoretically, there could be more efficient ways of providing the socially desirable level of assistance to public interest advocates, through direct subsidy. Practically, however, doing so is frequently, if not always, impossible. Consequently, there are good practical and theoretical arguments for special treatment. However, we know of no unbiased way of determining whether the social gains would exceed the social cost. Our judgment is that such exemption would be socially desirable. However, the problem of defining a genuine public interest organization is rather baffling. To avoid some kind of new identification of "deserving" groups and for administrative simplicity, it seems appropriate to exempt from royalties, through explicit extension of fair use, all 501(c)(3) corporations.

2. The Consumer Interest

The consumers' interest in an increase or decrease in the level of copyright protection in these rather special areas of economic activity is typically remote. With present technology, there is virtually no direct use of computer products by consumers. Consumers' interest lies almost entirely in increasing the availability or reducing the price of other goods and services in whose production computer materials are employed. Eventually some consumers may make more direct use of computer materials; at that time their interests will be served by increasing the availability and reducing the price of particular types of computer products.

Some small fraction of consumers make direct use of photocopying of copyrighted materials. However, again the main use is made by intermediaries producing some good or service that may eventually redound to the interest of consumers. Such intermediaries, as in the case of commercial users of computer based information may be thought of as surrogates for consumer interests, but

the linkage is remote. In particular most of the relevant use of photocopying appears to be, as shown in Chapter III, by professionals using specialized literature in research and academic pursuits. Except for some educational use, the consumers' interest is diffuse and lies in the overall efficiency of the production of technical and cultural information and in the eventual efficiency with which future consumer goods and services are produced.

People in their other major economic role--as workers--similarly have indirect interests for the most part. Improved availability of computer materials or photocopyable materials may indirectly affect conditions in the workplace. Finally, it is important to note that consumers have an interest in the efficiency with which government services are provided. This extends to services they consume directly, such as education or policy protection, and to those from which they benefit indirectly such as defense or environmental protection.

The consumer interest in other aspects of copyrights may be more direct, for example, the applicability of copyrights to musical reproductions, but in the area of our concern, their interest is in the overall efficiency of the economy and the contribution of information to that.

3. The Basic Trade-off

Because information is a vital ingredient in virtually all productive processes, the consumer's interest lies in a maximum flow of new information becoming available over time and in maximum availability of the presently existing stock of information.

It is obvious that the consumer interest includes maximum accessibility to the stock of existing information. Any increase in the cost of using information would tend to increase the costs of producing other goods and services, retard the development of new ideas, and reduce direct consumption of information. Hence, any system that increases the cost of access to existing information, or in any other way restricts access to it, imposes some costs on consumers and society as a whole. However, because information is so vital in both production and consumption, it is also of importance to consumers that the creation of new information be maximized.

The concept of copyrighting and patenting new ideas derives from the belief that, first, the amount of new information will be greater the greater

the expected rewards to those who might create it and, second, that one effective way--perhaps the best way--to provide adequate compensation for new ideas of commercial value is to make available to those who develop them, a degree of monopoly power over exploitation of their ideas. Because the income derived from a patent or copyright depends entirely on how much the society is willing to pay for access to the protected information, there is a strong presumption that, however much the copyright holder receives, it is no more than what his/her ideas are worth to society.

Thus, we are left with a conflict: to the extent that greater stringency in copyrights decreases the availability of existing materials, it is disadvantageous to consumers; to the extent that it increases the production of new materials it is advantageous to consumers. In simplest terms, the purpose of this report is to explicate this conflict in the areas of photocopying and computer-based information. It appears, at first, as if there is a simple trade-off: the greater the stringency the greater the opportunity, on average, for innovators of ideas to reap economic gains from innovating; the higher the price for access to existing materials (presumably high prices, i.e., royalties, yield higher returns to innovators) the greater the present costs to consumers. In such a situation the optimal degree of restriction, from the consumers' point of view is that which creates the ideal balance of access to existing information versus stimulation to production of new information.

The nature of the gains and the losses from such trade-offs are relatively easy to specify in theoretical terms. However, in this case there is a major complication. The amount of new information that will be produced is, like any other commodity, dependent upon not only the expected revenues to be derived from the new ideas but also on the costs of producing them. Since an essential ingredient in the creation of new knowledge is access to existing knowledge, the trade-off is obscured. To the extent that greater stringency in protecting existing knowledge increases the cost of developing new information, such stringency tends to counter its intended contribution to new knowledge. It is impossible to quantify the impact of greater stringency on either the inducement to create new information or on the cost of doing so. Indeed, if copyright law were made more stringent that would, as already indicated, not necessarily dictate that greater royalty payments (or other restrictions) would be imposed--such change would only permit such action.

In coping with this three-way trade-off, the government has available three major kinds of policy variables: the scope of copyright (or patent) protection, the duration of protection, possible exemption of some uses or users from copyright restrictions. Scope of protection includes such considerations as what materials should be subject to copyright? Should all of the historical forms of protections be continued (or added to), for example, should the power to hold material off the market altogether be precluded? The question of duration is obvious, the longer the duration of protection (up to the full economic life of the material) the greater the potential return to the holder and the greater the cost to consumers. This report is concerned with two broad questions of exemption, whether particular materials and uses--computer-related information and photocopying of printed material, respectively--should be exempted from copyright protection and whether there should be exemptions for particular users.

We can say that increased copyright powers would serve the public (consumer) interest if:

- o the supply of information is less than is socially optimal and if more stringent copyright authority would increase the supply toward that optimum,
- o it were the most efficient way to do so,
- o royalty payments reflect the value of the product to its users, and
- o there are no significant barriers to entry into each information market in question.

CHAPTER II

THE PROBLEM AND THE PIE-C APPROACH

A. WHY CONSIDER COPYRIGHTS?

As long as the American economy is predominantly a market economy with consumers' material wants being met--to the extent that they are met--largely through the response of profit-oriented producers to monetary demand for goods and services, there is a strong presumption against any form of monopoly. Yet there is a long history of granting specific monopolies through patents and copyrights. The basic rationale for doing so and the conflicts inherent in doing so have been alluded to in the first chapter. Here we shall discuss some of the factors that have led policy makers to support granting to producers of new information monopoly rights to the exploitation of that information. It is important to understand that we are dealing with the intellectual considerations in determining whether greater or less stringency in such protection of innovations is in the public interest, not with the power politics of copyright (and patent) policy.

In a market that functions in accordance with the precepts of a free enterprise economy there would be no economic justification for copyrights. In this section we review the characteristics of such a market. Then, in the next, we discuss the nature of the markets for information and indicate their very special characteristics, in particular, how they differ from the competitive ideal.

In a market economy the unregulated forces of supply and demand in a particular industry, and in all industriss together, can be shown to maximize--for any given distribution of wealth-- the economic well-being of consumers as a group, if a number of assumptions regarding "perfect competition" are effectively fulfilled. The assumptions relevant to the present study include:

- Absence of externalities: the impacts of the industry fall entirely on the sellers and buyers of the goods involved, with no effects, either positive or negative, on third parties; such effects include pollution (on the negative side).

- o Exclusivity or appropriability: only those consumers who purchase the product at the price set by the producer can obtain its full benefits.
- o Competition: producers are in close enough competition with each other that no individual firm can raise the price it receives by reducing the amount it produces and, hence, no producer can obtain (over the long run) profits above a "normal" rate of return.
- o Comparability: the products of different firms in each market are identical (undifferentiated), so that consumers purchase solely on the basis of price.
- o Marginal-Cost Pricing: the price at which a good is sold is equal to the cost (including the "normal" profit) incurred by the firm in producing and selling the marginal unit of the good.

The proposition that a competitive market maximizes consumer well-being not only abstracts from the distribution of wealth, but also leaves aside the questions of which consumers benefit and to what degree. Thus, if one believes that the current distribution of wealth is unjust, one would expect a "perfectly functioning" competitive market to produce unjust results. However, the ideal way--and the only promising way--to reduce such injustice substantially is to change the distribution of wealth directly. Efforts to rig markets to offset inequities in the distribution of wealth typically risk doing more harm than good, although there are important exceptions concerning information, as indicated in Chapter I.

B. THE MARKET FOR INFORMATION

The markets for information and for literary or artistic creativity contrast sharply with this ideal. For each of the information markets considered in this paper the industry has its own characteristics, but they have, as well, some important attributes in common.

1. The Nature of Information

First, information itself has special characteristics:

- o Information is complex. It is used at virtually every stage of the production process and in consumption. In many cases, the complexity of information may make it accessible only to a select group of "experts" and require large costs to process the information to make it more universally intelligible.

- Information is costly. This is often forgotten since the explicit cost of obtaining an additional piece of information is often zero, but there are costs involved in the production, storage, retrieval, processing and transmittal of information.
- Information is valuable. This may seem readily apparent. It is important to remember, however, that information is never so valuable that its cost should not be counted. Anyone who continues to search for the very last bit of information to become perfectly informed before making a decision is rarely using good economics in his search process. The very last bit of information is typically inordinately expensive compared to the benefits deriving from it.
- Knowledge can be destroyed and storing knowledge is costly. The death of "wisemen" typically destroys much valuable information. Retrieval of knowledge from human memory is not costless and must be kept effective by constant mental exercise. Storage in computer memories or in written records requires substantial initial cost and at least some maintenance cost.
- Ordinary use does not deplete the stock of knowledge. In this respect, information differs importantly from material goods such as mineral resources or an auto dealer's inventory. One person can use a stock of knowledge yet there is no diminution in the amount available for others. This means that there is little or no cost to society from use of available information, once it has been created. For example in the case of widely demanded items such as news stories, their sometimes high initial production costs need be incurred only once, while the case of reproduction brings the cost per reader down to a tiny figure.
- The production of knowledge. In some instances, such as some computer applications, a "creator" may come up with part of an idea, a "user" suggests ways in which his use of the idea could be increased, thereby triggering a new idea or alteration of the old idea by the "creator." Such a process reduces the private nature of knowledge or the extent to which knowledge should be considered an exclusive property of a single creator.

- o Information may be substituted for other commodities and other commodities for information. Consulting services provide a very apparent example of this information characteristic. More profoundly, the rise of the modern multi-national corporation may to a large extent be explained in terms of this characteristic of information. This is valid to the extent that the multi-national exports technology (e.g., technological competence) or managerial skill as well as the commonly recognized export of physical capital.
- o In some instances information may actually be over-abundant and this is a major and costly problem in itself. The term "information pollution" has been coined to describe the situation of people assailed by an excess of trivial messages. Simply adding more information is not necessarily helpful unless it is information relevant to the user. Television ads or real estate want ads, for example, may give one more information than is helpful and may actually overwhelm or mislead the buyer.
- o Much information, especially that which has been processed into relatively accessible form, is often easily used at no price to the user beyond the cost of helping himself. Many knowledge producers (and a lesser number of knowledge distributors) not only do not obstruct but often actively encourage the unpaid appropriation of their work.

2. Cost and Price Characteristics of the Industry

The "industry" producing information has some characteristics that fail in important ways to match the competitive model. Some of these derive from the characteristics of information just discussed.

We have found no adequate economic description in the secondary literature of either the publication industry or the computer software data-base industries. However, the following general outlines appear to be broadly applicable.

Each publishing house typically produces many products and several product lines: a company may publish mass market paperbacks, trade and

text books, magazines and journals, for example. Within each product line there are many titles--many text books and several professional journals, for example. Each edition of a book may go through one or more printings and the size of run in each printing may vary, from a few hundred to tens of thousands. Each magazine or professional journal is published, typically, on some schedule, and each issue could be printed in a varying number of copies.

The industry is characterized by a complex of "fixed" costs (or "joint" costs). It would carry the discussion far afield to discuss the subtleties of joint versus fixed costs, so we refer to them all as fixed costs. A publisher may have--typically does have--a management and marketing complex that handles many or all of its products. Similarly a publisher may own or have long-term contractual access to printing and other facilities. Whereas the size and nature of these assets are presumably determined by the expected volume and kind of publication to be performed, they and their costs do not change with short-term, say monthly, changes in the actual number of pages printed.

It may be that there are substantial economies of scale in the organization and procurement of such assets. That is one possible explanation of the high concentration ratios observed in the industry (Chapter III). It is not these corporate-wide fixed costs that are central to our discussion, but they have to be identified and set aside in order to avoid confusion with some fixed costs that do lie near the heart of the argument.

Two sets of costs are critical, a fixed component of the costs of each individual product--its setup costs--and the short-run variable costs, i.e., the costs of making copies of each product. In publication, the setup costs of the publishing house consist of such activities as working with the author, editing, and, in some areas, gathering and compiling data. The authors' setup cost is essentially the cost of writing the manuscript and performing the research or other creative tasks underlying that process.

Information available on the relevent portions of the computer industry is even less complete. It appears, however, that there are analogous setup costs associated with production of software, data bases and computer-created works. These costs, again, appear to be independent of the extent of use of the computer materials--the number of times they are copied.

The setup costs in production of software, data bases and computer-created works include the accumulation and categorization of data, analysis, and programming.

In both industries setup costs are one-time costs--for each book, journal article, data bank, program. The fact that in many instances they have to be updated does not change the basic fact that once the task is performed a potentially valuable asset has been created, and created at a cost to the producer and the society.

Unless producers of computer works and printed materials can foresee with a high level of confidence that they will at least recoup the total costs--including the fixed costs--they incur in bringing new information into existence and making it available, they will have no economic incentive for doing so and, in most instances, can be expected to discontinue or (perhaps more important) not begin developing and disseminating new information. Consequently, it is necessary for them to price copies of their output at more than the cost of reproduction. In the ideal perfectly competitive market, short-run marginal cost should equal price--just as should long-run marginal cost. That condition of perfect competition apparently can not be met in the information industries, without protection or price discrimination, which are, themselves, inconsistant with perfect competition.

Further, once its setup cost has been incurred, copying a work is relatively very cheap. Other publishers could, in the absence of copyright protection, reprint books, journals or articles at only the cost of printing (and binding, etc.). Individuals can photocopy parts or all of publications at low and rapidly declining absolute cost per page (although higher than the cost of mass producing most printed materials). Given access, existing data banks, new computer works or computer software can also be readily copied for individual use or, potentially at least, for resale. In practical terms, this means that if a producer charges a price adequate to recoup total cost--including fixed cost--others can reproduce the work at less than its price. Whereever doing so constitutes a substitute for buying the work from the original producer at its full unit cost or, a fortiori, reproducing the work makes copies available for resale to others who would be potential customers of the original producer, the difficulties of covering full cost are potentially large.

3. Non-exclusivity

This is one of the central aspects of the traditional rationale for copy rights and patents. However, many industries have high fixed costs, including costs exactly analogous to the setup costs alluded to here. Most of them are able to attract the resources needed to meet the market demand for their goods without privileges analogous to copyrights and, in many cases where industries enjoy analogous protection, consumers would be demonstrably better off were those protections removed.

In the information industry there is, however a major and nearly unique problem, non-exclusivity (or non-appropriability) unlike the case of physical goods (at least those whose design is not highly original), the producers or creators of useful information are often unable to assure that its benefits are restricted to those customers who purchase the information. This applies to both physical inventions and to knowledge and creativity embodied in written and other forms of communication. Once the original producer has sold--or other wise provided unrestricted access to--the work, without governmental intervention, it has no sure way of appropriating all the value that might be realized through using or copying the work.

The nature of costs prevents providers of information from equating short run marginal cost and price; at the same time, the non-appropriability of information makes it impossible to assure that all beneficiaries of proprietary information pay for using it. Thus, the conditions of perfect competition are not met, so the prospect that governmental intervention could improve on market results is well founded in theory.

The practical consequences of these characteristics of the industry are equally important. The combination of the fact that works can be copied at costs far below the total unit cost of producing new information coupled with the non-appropriability of information means that in the absence of some protection of proprietary rights in information or some form of compensation for innovation, the market would produce less than the socially optimal amount of new information, to the ultimate detriment of consumers.

Copyright (or patent) for protection, however, permits (to the extent that it is enforceable) the originator of information to charge a royalty for the use of reproduction of the material, thus appropriating more of the benefits of use than would otherwise be possible. If the expectation of

the returns from such royalty (plus any other income associated with producing the work in question) is adequate to cover the total costs and provide an adequate return, the potential producer will have economic motivation for producing new information. If revenues from doing so are large relative to costs, others will be encouraged to enter the field, expanding the supply of such information.

4. Competition, Monopoly and Product Differentiation

There is a wide range of variation in the degree of competition among sellers in various markets for information. In some cases effective competition appears to be keeping profits and prices down, while in other cases an important element of monopoly control (or market power) is exercised by one or a few producers. One must be careful to define the relevant market correctly. For example, it is inadequate to say that since a large number of popular, or general circulation, magazines exist that there is effective competition from the standpoint of consumers. The magazines cater to a wide variety of needs and tastes, and for any particular type of periodical (photography, gardening, financial, etc.) there may be only a limited number of firms in the market, resulting in costs and prices above competitive levels and in excess profits. Such uniqueness of each product (magazine)--known as product differentiation--is inconsistent with competition.

5. Externalities

For some categories of information and creativity, society has historically decided (via the political and other processes) that there are significant benefits deriving from their production and dissemination that are external to both the actual producers and consumers involved. (The possibility of negative externalities, as suggested, for example, by those who favor censorship, is not considered here). That is, it is widely believed that the whole society gains from having more knowledge produced and from having more people become knowledgeable, to a greater degree than would be indicated by market transactions alone. Much basic research, even with effective systems of exclusive reproduction rights, while of significant social value is too remotely related (if at all) to marketable products to be commercially valuable. In such cases, private markets do not adequately serve the public welfare, and subsidies--necessarily paid for by consumers (often through taxes)--are used. The subsidies given to academic research, libraries, and students by the government and various philanthropic organizations are indications of the widespread benefits which information is considered to promote.

A second reason for public subsidies is the fixed-to-marginal-cost relationship. Subsidizing producers to the extent of their fixed costs, and then having prices to customers equal the (low) short-run marginal cost of distributing the intellectual product is one alternative. The government could also hire its own researchers (as it does in some areas) instead of paying subsidies to private individuals and groups.

It does not follow, nor is it obviously true, that all the research undertaken is justified by the expected benefits. In addition there may be some negative externalities in adding to the stock of available knowledge associated with difficulty in obtaining the small fraction of it that may be useful and relevant in any particular case.

In conclusion, because of the fact that any effectively competitive market does use resources efficiently in meeting the demands ("needs") of consumers, there is a presumption against any policy that introduces monopoly power. Further, the fact that markets have "imperfections"--such as those just indicated for the markets for information--by no means suggests that the way to offset them is to introduce any element of monopoly, such as copyrights or patents. Market imperfections are only a necessary not a sufficient condition for introducing such instruments. Whether introducing or strengthening the limited monopoly power provided by copyrights is in the interest of consumers is, then, an empirical question.

C. STAGES OF PRODUCTION

We have discussed the creation and dissemination of knowledge as if there were a single entity which brings knowledge into existence, reproduces copies of the work (in whatever form) and makes it available to the public. For written materials, both books and periodicals, the authors are, in the vast majority of instances, separate from the publishers (which also applies, for example, to musical recordings). The authors operate as independent economic entities, not employees of the publishing house; there are, of course, exceptions--in journalism and the financial press, for example. For present purposes, the major significance of this dichotomy between the two stages of production is that the response to economic incentives may be much different at the

different stages. The distinction between the two stages appears to be of far greater significance in the publishing industry than in the computer business, although there has not been enough empirical analysis of these relationships to permit making such an assertion with confidence.

Any policy based on ensuring that providers of a good or service obtain adequate returns on their investment obviously is based on the assumption that production is responsive to the level of returns. In the case of authors, we are considering the response of intellectual creation to the availability of royalties from copyrights or patents (or some other source of compensation). There are two reasons why this assumption must be re-examined.

First, a substantial proportion of informational and (to a lesser degree) artistic production is done by individuals or research groups receiving university salaries, government or philanthropic grants, or other sources of income independent of royalties on their work. To the degree that royalties constitute a small portion of their incomes, and/or their salaries are enough that their effort responds only slightly to the opportunity for earning more income, royalties will have little effect on their supply of intellectual work.

Secondly, it can be argued that the quality and quantity of work done, particularly in academic and creative fields, is dependent more on non-monetary incentives than on a desire for greater income. To the degree that production responds to the intrinsic satisfaction gained from doing the work, to altruistic motivation, to a desire for recognition, and to other factors, royalties will, again, have little effect on the supply of intellectual work.

Thus, to the extent that these conditions prevail in <u>particular</u> fields of creativity, the result of royalties in those fields might appear not to make more information available but simply to transfer income from the consumers of those products to their producers.

The situation is, however, more complex. First, even though many authors may not be responsive to monetary rewards directly associated with their producing publishable works, undoubtedly some are. Although some creative people are willing to undergo very substantial material deprivation for the sake of pursuing their creative endeavors, casual observation suggests that far more of them will publish if to do so they do not also have to perish.

There are alternative ways of compensating producers of information. As stated above, a large amount of research is publicly supported. To simplify, if there were no monetary reward for writing for publication only those authors who had no monetary incentive would write. As the amount of the expected monetary reward rose, more and more of those authors motivated by the prospect of pecuniary gain would undertake to produce. Further, even those whose primary motives were non-monetary might find that with adequate monetary compensation they would (perhaps could "afford to") devote more effort to writing.

Further, the second portion of the producer sector is made up of institutions, for-profit corporations and not-for-profit institutions. Both must cover their total costs of production if they are to survive in publishing or data processing, and potential new entrants must foresee the ability to do so if they are to be able to enter. Some publications can be cross-subsidized to cover their costs by for-profit organizations, as loss leaders, for example, or by not-for-profit institutions as part of achieving their broader purposes, but the greater the prospects of recovering costs, the greater the incentive for both groups to expand their publication activities.

Where there is effective competition among publishers, any pure monopoly profits for the firm as a whole will, in the long run, be competed away. However, this will occur only on the average for all the publications of a given publisher, or for all the publications of a particular category: trade, mass market, etc. Marketing a piece of literature involves great uncertainty in that the sales of a book, or, to a lesser degree, magazine, cannot be predicted with accuracy, and, as discussed above, some substantial fixed costs are incurred once the publication is undertaken. One of the functions of publishers is to absorb part of the risk by selling a large number of items, some of which will do better and some worse than expected. Unusually successful works will mean high profits for the publisher (and, typically, large royalties to the author), while disappointing ones may mean losses. Wherever a publisher has considerable monopoly power, for example, through effectively differentiating its product, it may be possible to realize monopoly profits.

The availability of copyright protection prevents publishers from only copying those works of other publishers that have been proven successes (thus avoiding the risks of publishing works of unknown commercial appeal). If applied more extensively to photocopying, copyrights would also permit supplementing revenues from sales by the imposition of royalties for photocopies. Thus, copyrights tend to increase the prospects that enough works will be profitable to offset the risks that some other publications will generate losses. The greater the profits on individual successful works, the larger will be the number of works published, unless there are barriers to entry. Copyright protection, as already stated, may serve to offset the tendency for non-appropriability in face of the relatively low cost of copying existing works to cause the market to produce less than the socially optimal amount of new information.

Thus, we have the basic case for copyright protection. Before proceeding to the more specific analysis, it is desirable, however, to point out that even given a need for revenues that will cover the entire cost of production (including normal return on investment for the for-profit sector, at least), it does not necessarily follow that stringent copyright laws are the most efficient and equitable way of providing expected returns adequate to induce the optimal amount of creativity.

One alternative is government subsidization of authors, with their works then put in the public domain. Such policy has the advantage that, although consumers must still pay, through taxes, the absence of royalties would encourage maximum dissemination of the material. However, there are various serious difficulties with governmental subsidies, not the least of which is accurately making the amount of support proportional to the social value of the research or creative endeavor. Under a copyright system, where demand determines the returns to the author, this allocation function is performed by the market.

Possibly more important is the danger in further centralized, institutional control, of the creation and provision of information. Subsidies must necessarily be given out by a commission of some sort, which is certain to have biases which will restrict the free flow of research and dissemination of knowledge. Under copyrights an author is responsible to the general public for the quality and relevance of his/her work. While this is certainly not a perfect mechanism, it is likely to involve less danger of censorship and governmental use of public funds to serve its own ends than would a more

extended system of subsidies. Even under the present system, it can be argued that research is undesirably constrained by, for instance, the parochial attitudes which may exist in academic departments pressuring faculty to follow certain lines in their work. Increasing governmental power (or centralized control of any form) has well-recognized drawbacks, that appear to be particularly severe in the field of information. On the other hand, it is not always clear that information that is demanded by the market constitutes the socially optimal quantity and quality of information, witness TV programming which for the most part reflects only "what will sell."

1. Conflict-of-Rights

One approach to the issues raised in this report is to assume a basic conflict between the rights of two groups--the producers of intellectual works, on the one hand, and the using and consuming public, on the other. The "rights" of the producers involve having proprietary rights in their work firmly established and protected. The "right" of the public is to have unrestricted access fo and use of (including the right to copy) existing intellectual material. The approach assumes the existence of rights on both sides, and weighs the awards in favor of the side with the greatest rights. Viewing the issue as a conflict of rights has drawbacks. The major drawback is the normative nature of the approach, and the inherent, subjective nature of any resolution of the conflict.

2. Maximizing Benefits to the Public

An alternative approach which, among other things, needs fewer philosophical assumptions to arrive at a conclusion is to seek to maximize benefits to the public. This approach considers benefits to producers only to the extent that they are members of the public. The size of the costs and benefits to individual members of each group from various policies is considered as is the relative size of each group. The "public" is defined as all those persons who gain from the provision or use of copyrighted material. The ratio of "producers" to the relevant public is typically very small.

Under this approach, therefore, the optimal amount of protection of copyrighted work is that which necessary in order to maximize benefits for the public (as defined above).

The differences in the two approaches is summarized in the table below:

TABLE 1

Characteristics of Two Approaches

	Conflict of Rights	Maximization of Public Benefits
Basis of policy analysis	"Right" of opposing parties	Aggregate net benefits to all parties
Emphasis	Normative	Positive
Is relative size of group considered?	No	Yes
Is net benefit to each group considered?	Yes	Yes

The advantage of the approach which maximizes public benefits as opposed to one which tries to resolve conflicting rights is that benefits may be more easily defined than "rights". Factors which increase welfare are said to increase consumer benefits. Examples include decreasing costs to consumers, increasing availability (quantity) of services to consumers, and increasing the quality of benefits to consumers. A rigid application of this approach would involve concluding that the policy that created the maximum net benefit to society as a whole is the best policy--without regard to how those benefits are distributed. As mentioned above, distributional impacts should be considered in analyzing the application of copyright powers. The necessary adjustments are made without losing the advantages of the benefits approach.

"Rights" of parties involve judgments which are difficult to define on any objective criterion, let along to quantify. A still more difficult question than "What rights exist?", is "What rights should exist for each of the parties?" Furthermore, the kind of information one might desire in order to answer the question, "What rights should exist for the various parties?" would be likely to be contained in the analysis of benefits to the public. This is especially true if benefits to the public is the basis of allocation of property rights among competing interests. Therefore, the benefit to the public approach is more general and also based more on readily defined, objective criteria than is the property "rights" approach.

In light of these considerations, PIE-C has elected to use the approach based on maximizing net benefits to the public. Whereas, as was discussed in Chapter I, all of the public, whatever its other roles, plays the part of consumers this approach is likely to yield results identical with or close to maximizing consumer interests, as we have defined consumers.

3. Basic Tradeoff, Again

The stated objective of copyrights and patents under the U.S. Constitution is to "promote the useful arts and sciences"--to provide an opportunity for the creators of information to obtain a return on their work, and, thus, to be encouraged to innovate. Our explication of this has been in terms of avoiding the consequences of non-exclusivity--of permitting producers to obtain payment whenever their work is used. Yet it is clear that such payments imply costs to the rest of society. As discussed in Chapter I, consumers have an interest both in maximizing the generation and production of new information and in seeing that these products, once created, are available at the lowest possible price. It was pointed out that these two objectives conflict to some degree, as do the buyers' desires for maximum production and minimum price in the market for any good. In the cases we are considering, there is one basic tradeoff between more innovation and production on the one hand and, on the other, higher costs of accessibility to existing works.

Looking only at the copyright case (patents will be discussed in the chapter on software), there appear to be two prime variables that affect the extent of this tradeoff: the term, or duration, of protection and the scope of protection. The latter involves not only determination of such issues as the classes of information and the uses and users to be subject to copyright protection, but also it involves making some complex qualitative distinction on how similar work must be to constitute infringement. We do not get into that issue here. It is the term of protection which is relevant as the major policy tool, within any class of protection. Presumably, for any given scope of protection, the longer the term of copyright protection, the greater the potential returns will be, thus, both increasing the expected production and raising costs to consumers.

In Economics of Property Rights as Applied to Computer Software and Data Bases[1] a mathematical model is developed for "The Optimal Duration of Copyright" as applied to computer software. The study essentially assumes

that duration of copyright is highly correlated with, if not identical to degree of protection. A second study, by two of the same authors, deals in parrallel fashion with the question of scope of coverage as reflected in expansion or curtailment of fair use.[2] It reaches analogous conclusions. Further, the findings of both studies comport with a widely accepted theory that shows what pricing structure will, for any given level of revenues, minimize consumer losses from monopolistic power. The theory is applicable to situations in which (as is generally the case in information industries) the high fixed costs of production neccessitate that for a firm to cover total costs (again including a "normal" profit) the price of at least some units of the product must be above short-run marginal cost. Consumers are divided into as many distinguishable groups as is administratively feasible, according to the degree to which the demand for the product responds to a change in price (the elasticity of their demand). Then:

> "the theory prescribes that for each product and for each class of buyers, percentage deviation of price from marginal cost ought to vary inversely with the elasticity of demand."

That is, prices should be raised most for those classes of consumers whose purchases are least affected by the change, and raised the least (or lowered) for those consumers whose demand would be most altered by the change. Empirical evidence suggests this course is pursued by producers whenever they are able to discriminate in pricing, which one would expect to be the case since such a pricing scheme maximizes their revenues. Some of the features and conclusions of "The Optimal Duration of Copyright" are applicable to copyright policy in general.

An interpretation for general policy of the conclusions of that study, is:

- The extent to which society prefers benefits in the present to those in the future (as measured by the discount rate) is an important factor in giving protection to any form of intellectual work. The more society is concerned with the present, and the less it is concerned with the future, the less protection should be given to creators, i.e., the greater should be the dissemination of (the lower the price of) existing work.

- The desired degree of protection, as reflected in the duration of copyrights depends, in most cases, on the sensitivity of demand to changes in prices. The more the amount demanded tends to increase as price falls and to decrease as price rises, i.e., the more "elastic" demand is said to be, the less the amount demanded changes with price changes.

  "...if demand is inelastic then little is sacrificed by having a...monopoly price charged for the use of software, and society can afford to grant a longer period of protection. On the other hand, if monopoly pricing excludes many potential users from taking advantage of existing software--that is, if demand is more ... elastic--then the loss resulting from a monopoly is more serious and a shorter period of protection is appropriate."[3]

- The longer a form of intellectual work remains commercially valuable, the longer it should be protected. In balancing the desire for increased future stocks with that for maximum dissemination of existing stocks, lengthening the period of restriction is more worthwhile the longer will be the later period of low-cost availability.

The model (and the other theorizing alluded to above) is designed to show what policies would maximize total social welfare, defined as "the sum of consumers' and producers' surplus, as it is customary in economic literature." However, as the authors point out, "This definition of social welfare ignores considerations of distributional equity, and simply adds up the monetary gains to each participant in the economy.[4] In other words, the conclusions are reached without regard to who is getting most of the benefits from the maximizing policy--the producers or consumers of intellectual work. Clearly the question of distribution of welfare should be taken into account in any choice of policy.

The factor which determines the split of benefits between producers and consumers in these theories is the shape of the demand curve facing the individual firm. This shape can be taken to mean simply the degree to which consumers respond to price changes, so that the less they respond, the fewer consumers stop buying the product due to an increase in price. Hence, their conclusion that the less change in level of output the better, as consumption of the information remains relatively unaffected. Meanwhile, more expensive (in real resources) goods will be produced, that would not otherwise have been, because the higher prices paid by customers mean greater profits for producers. This increase in supply (here meaning not more units of one particular sales item, but a greater variety of items) causes total welfare to increase in

most cases. The analysis appears to be couched in terms of the demand for all the output in a particular market. However, the shape of the demand curve facing an individual firm can also be taken to indicate the degree of monopoly power in a market--the degree to which producers are able to control the market so as to maximize their profits, at the expense of consumers. In an industry with effective competition, the firm can sell all it wishes to at the market price, but initially nothing at any significantly higher price. In such a situation, an increase in the term of protection will have no effect on the distribution of benefits between producers and consumers, because the producer can not raise its price significantly anyway. Competition implies that, in the long run, producers tend to obtain about the "competitive" rate of return. An increase in the length of protection, allowing producers to profit from sales farther into the future, would permit reducing the price on current sales, as entry into the market with close substitutes occurs. Thus, an implication of our reasoning is that under competition there is no identifiable limit to the period of protection.

The more a market deviates from perfect competition (due to product differentiation, a limited number of sellers, and/or collusion among sellers) the more each firm can raise prices by restricting output. The more monopolistic an industry is, the more a lengthening of the term of copyright, or otherwise increasing protection, will transfer income from consumers to producers.

In analyzing the appropriate policies for each of the various fields of intellectual production, this point is crucial. While an evaluation of total economic welfare may imply the desirability of protection, regardless of the structure of the industry, the impact on consumers is critically determined by the degree of competition in the industry.

4. Extent of Monopoly

In any industry, monopoly power is a function of substitutability of other goods for the monopolized one and of the barriers to entry. To the extent that each firm's product takes on substantially unique characteristics, it no longer has close substitutes, and significant market power comes into existence. For example, in choosing between two different makes of subcompact cars, the consumer faces some degree of monopoly in part because the cars are not exactly alike--they are not perfectly interchangeable--and so each producer

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has a measure of leeway in setting prices. A case where there is less substitutability is in the choice between taking a bus or a taxi to a particular destination--the options are not highly interchangeable and, if there is only one bus company or one taxi company, each firm can exercise substantial monopoly power (which is the rationale for regulating taxis and buses).

A major barrier to entry--and the only one we address--is large initial expenses, in production, distribution or marketing, that must be made in order to gain entry into a market. In the classic case of the auto industry, again, a new firm would face tremendous barriers in the capital needed.

Our questions are to what degree is there substitutability among copyrightable items, and to what degree are there barriers to entry into the relevant market? For simplicity consider for the moment only authorship of written work. It is clear that in most categories of creative, scientific, and technical writing there is a large number of competitors. Entry barriers appear not to be so high that one or a few authors have tremendous advantages.

Substitutability is a function of the quality of the work. There is a high degree of interchangeability between, for example, various mediocre journal articles or mediocre novels. In both cases there are many people with abilities and training in the field, each of whom can write according to consumer preferences (or commercial and academic needs for research). Thus, based on the N.Y.U. analysis, neither the entry barriers nor substitutability appear to create the conditions under which copyright protection would afford significant market power to authors for <u>most</u> written work.

It is only when we come to very original research or excellent writing that there appears to be a significant possibility of monopoly profits to authors, due to the small number of people (possibly only one) capable of doing the particular work in some area of creativity or scientific investigation. Such works may indeed be virtually unique--little substitutability is possible. If there is a substantial market for them they can command a very high price, with the attendant costs to consumers and society as a whole. On the other hand, it is clear that the social costs in reduced dissemination (relative to the zero-price case) can only increase monotonically as the benefits to society increase as a consequence of the work's having been done at all. It may be, as already indicated, that the possibility of large monetary returns is not necessary to bring about some, or all, highly innovative and creative work. In those cases the efficiency

justification for copyright protection is eliminated. But obviously there are substantial risks that valuable research and writing would be discouraged if protection were removed. Also there are some equity questions in depriving those who would produce without monetary reward of the chance of receiving it. There is the countervailing consideration that, making existing work more readily available (at no royalty) reduces the cost of new information. However, this last seems likely to have a small effect in the relevant cases.

The great number of people who have creative skills adequate to meet much of the commercial demand for writing, suggests that concentration of monopoly power in the hands of authors is not likely to prove to be a major problem. This does not mean that some authors will not make occasional large rents, but that averaging out the gains and the losses, the income of authors as a group will not be expected to exceed their potential earnings in other fields.

Similarly there appears to be relatively close substitutability among the products of various publishing houses with the exception, perhaps, of a few specialized journals. So relatively little monopoly power can be expected to derive from that quarter. Monopoly power in the publishing industry would appear to derive from economies of scale in marketing. As described elsewhere there are relatively high fixed costs or setup costs associated with the publication of a particular book or journal--costs, that once incurred, need not be incurred again as more and more copies are made. However, since any one publication is typically a small fraction of the output of the large publishers, this is not apparently a significant entry barrier.

In the chapters on software and computer data bases, it is shown that there appears to be substantial monopoly in the data-base "wholesaling" industry but substantial competition among independent software produers.

5. Regulation and Antitrust Action

In subsection 3 above, we discussed the distributional implications of exclusive rights to intellectual products, as opposed to the efficiency analysis done in the model "The Optimal Duration of Copyright," showing a major inadequacy of examining only the latter criterion. However, in theory at least, it is possible to reconcile distributional equity with maximizing efficiency. The model (if its other analytics are correct) does tell us

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what term or degree of protection will maximize total welfare. If protection results in excess profits for producers, an alternative to reducing it is to regulate the prices (royalties) charged. In principle, ignoring the costs of regulation, the latter policy would produce more favorable results for consumers than would reducing the extent or instituting a term of copyrights. In another paper, directed at scientific and technical information systems (STI), two of the authors of the model for software state:

> "If the policymakers are fearful that the abandoning of the fair use doctrine may generate unconscionably high profits for the producers and disseminators of STI by increasing the extent of monopoly power, then they should turn their attention to the problems of regulation of the industry. Regulatory restrictions, if desirable, should be placed on the price level and not on the pricing structures that the industry may present to the market."[5]

Whether complete freedom of producers to discriminate in pricing maximizes the welfare of information consumers depends on the degree of monopoly power which producers are able to exercise. From the consumer standpoint, discrimination which increases revenues to information sellers is desirable to the extent that more sellers are able to cover their total costs of production and distribution (including a competitive rate of profit), thus making more information available to consumers. In such cases, the market approaches the optimal solution without governmental intervention. However, for some information producers that have relatively large degrees of market power, price discrimination above a certain level will result in excess profits. If this is the case, it is still socially desirable to discriminate among different groups of customers so as to minimize effects on consumption; but excess profits should be eliminated either by 1) antitrust action, or 2) regulation which reduces prices to all classes of customers so as to leave the producing firm with a competitive rate of profit.

There are, of course, costs involved in a regulatory system, the most obvious of which are the expenditures needed for running the agency. The indirect costs, though, are probably more significant. The agency may not perform its function according to the announced intentions. There are, for example, great problems in determining costs and the competitive rate of return. It might restrict prices greatly, harming both producers and consumers as supply is forced down due to inadequate returns. More likely, experience suggests that the agency will tend to become a "client" agency, serving the interests of the regulated industry rather than the general

public. Producers may also be able to restrict the effectiveness of the agency through expensive, time-consuming litigation about the agency's rulings. Finally, there is always a danger in legislating more power for another government bureaucracy, particularly discretionary authority, because any agency can be expected to serve its own interests.

Regulation has been deemed to be economically justified when the regulated industry constitutes a "natural monopoly." That is, the minimum size of an efficient firm is so large relative to the market that it would be highly inefficient to have a number of firms competing; in such cases, all but the largest firms tend to be driven out. Examples are local public utilities (water, electric, etc.). There appears to be no significant natural monopoly characteristic of the information industries. It is also possible to have situations of market power where there is no apparent "natural" monopoly present. An example of this seems to be IBM in the software field. In these cases anti-monopoly action (antitrust litigation or statutory change) is the preferred policy, so as to restore competition and eliminate the need for regulation.

CHAPTER II

FOOTNOTES

[1] Braunstein, Yale M., Fischer, Dietrich, M., Ordover, Janusz A., and Baumol, William J., Economics of Property Rights as Applied to Computer Software and Data Bases, New York University, May 1977.

[2] Braunstein, Yale M. and Ordover, J. A., "Economic Views of Copyright in Scientific and Technical Information Systems," New York University, February 1977.

[3] Braunstein, et al, op cit, pp. 21-22.

[4] Ibid, p. 11 (text and footnote).

[5] Braunstein and Ordover, op cit, p. 19.

CHAPTER III
PHOTOCOPYING

The issue addressed in this chapter is whether it is desirable--serves the interests of consumers--to refrain from imposing further restrictions on photocopying of copyrighted works.

Under the 1976 Act, the only photocopying to be permitted which is not specifically authorized by the copyright holder is that provided under sections 107 and 108. Section 108 allows certain uses of library photocopying and section 107 allows photocopying under "fair use". In addition photocopying for direct face-to-face teaching is authorized without constraint.

It is currently unclear what constitutes "fair use" under section 107. Williams and Wilkins vs. the National Library of Medicine is the only major test case of photocopying of copyrighted works and that case resulted in a standoff, setting no general precedent. A major policy recommendation of this study relates to breadth of the definition of "fair use" that would maximize consumer well-being.

CONTU"S mandate includes "machine reproduction", an area considerably broader than photocopying. However, it has been possible to study only photocopying and consequently our report is restricted to that area.

A. NATURE OF THE PROBLEM

From the consumers' point of view, unrestricted (royalty-free) photocopying seems, at first, to be clearly preferable, because it gives the consumer a costless (or reduced cost) choice between copying and not copying. Photocopying restriction, on the other hand, reduces (raises the cost of) present consumption and, by increasing the cost of research and other creative activity, increases the cost of relatively near-term future consumption. However, as pointed out in Chapter II, protection of photo-reproducible material will, it is hypothesized, stimulate relatively remote future consumption by influencing the quantity of future copyrighted works.

In addition to the more obvious advantages of increasing the output of intellectual products, it is sometimes suggested that by increasing the numer of journals published the number of pools of referees would also be increased. Given that referees make errors and have biases, the probability that worthwhile articles would be rejected would be correspondingly reduced.

The basic question is whether making virtually all photocopying (exclusive of face-to-face educational use) subject to copyright restriction would efficiently assure that the supply of copyrighted works would be moved to or toward the socially optimal level. The imposition of royalties from new sources would (in the absence of great monopoly power) tend to increase the supply of published works, by making that activity more remunerative.

As discussed in the following section, photocopying of non-technical publications appears not to be important. The available evidence suggests that for the commercial publishers any such effect has not been critical; publisher profits have remained very healthy throughout the current period of rapidly rising photocopy machines sales.

The problem arises because of the non-appropriability characteristic of information. The case of printed material is something of a hybrid. Copies of journals (or books) are sold, largely to subscribers. In this way publishers do appropriate the benefits gained by the subscribers. Similarly by selling to institutions--typically at a higher subscription rate or price--they appropriate some of the benefits of other users (e.g., library users). Once either of those sets of copies are in circulation, cheap photocopying means that other users can, in the absence of protection, readily obtain benefits whose value cannot be appropriated by the publisher.

As just mentioned, some of the photocopying revenues are appropriated by publishers through price discrimination. Some photocopying revenues are not appropriated by publishers. It is not totally clear, however, that publishers should appropriate photocopying revenues since much of those revenues are the result of demand for photocopying service, not publishing services.

A substantial amount of photocopying takes place in public libraries, however, non-appropriated use results from use of library materials at no charge; not from the photocopying of these materials. Photocopying articles may be considered a particular use, but in terms of non-appropriability it is not distinct from borrowing the materials for any use. The single fact that libraries lend materials at no charge makes the services from those materails non-appropriable. Photocopying, reading, notetaking, or any other use of the materials does not affect their appropriability. The non-appropriability problem derives not from photocopying, but from the institution of free (lending) libraries themselves.

The institution of the library itself is the source of the non-appropriability. It is the library that lends to persons who do not pay the publisher for the journal or the book. The institution of the library itself is designed to encourage free use. Within libraries, photocopying makes use of the material more convenient for each non-payer (free-rider). But library photocopying does nothing to make (say) journal costs more or less appropriable to journal users. Library existence and library usage is the sole source of non-appropriability of journal costs and publishers outputs in general. If publishers are sincerely worried about appropriability of their output, charging individual library users rather than photocpiers would seem to be a more logical target.

It is a matter of some historical curiosity that publishers have not taken issue with the institution of lending libraries. This source of non-appropriability of costs from publishers output is clear-cut and long standing. In Europe, organized authors have, in contrast, frequently urged payment of royalties for use of books circulated by public libraries.[1] (Of course, none of this is intended to suggest that the institution of free libraries is not socially desirable. A strong case for them can be made on both equity and externality grounds.)

The fact that there are a large number of technical journals now, apparently in stable operation, clearly indicates, however, that some large portion of the benefits are appropriable without the imposition of royalties on photocopying. The fact that the commercial publishing industry appears to be thriving, strongly indicates the same conclusion for that part of the industry. The question is, would a more nearly optimal amount of technical (and other) publication take place if such royalties were permitted. To the extent that photocopying is a substitute for purchase of journals (or books) restricting photocopying--through charging a royalty or more restrictive methods--would tend to increase subscriptions (sales) and, all else equal, publisher revenues, thus increasing publishers' appropriation of the public benefit they create. If photocopying were predominantly a substitute for subscription or purchasing books, the impact on revenues could be very large indeed. This affect is independent of whether the copies made are resold by the copier. However, if they were to be resold to other individuals who, absent the availability of the photocopied materials, would subscribe to the journal the impact of photocopying, or of restricting, it would be greater.

If photocopying is not a substitute for subscribing, restricting it would have no effect on subscriptions. Royalties from photocopying could, however, contribute to publishers' revenues, and, hence, encourage additional publication. Royalties would also decrease disposable income of consumers spent in other sectors and decrease consumption and future production in those sectors. Whether royalty charges which have these effects are a good idea is a very difficult empirical question. The theoretical framework within which this question may be analyzed and answered is shown in Appendix C.

Any policy decision should take account of the equity considerations. Would alternative policies on copyright application to machine reproduction be fair? How, if at all, would they affect the distribution of income, wealth and power? Are there particular portions of the population who would benefit or suffer? These questions, as well as the efficiency questions are addressed in the analysis that follows. The existing data are extremely limited and do not permit a complete factual analysis. However, they appear to be an adequate base for defensible conclusions.

B. THE NATURE OF PHOTOCOPYING

1. What is Copied?

In order to examine the question posed above it is necessary to begin by specifying the nature of photocopying of copyrighted materials.

Casual observation suggests that most photocopying is reproduction of non-copyrighted material. According to Robert Frase[2] here are no good U.S. figures on this, but a University of Amsterdam study in 1972 showed the following ratio of copying copyrighted materials to non-copyrighted materials in the Netherlands.

TABLE 2

Category	Photocopies		Offset and Stencil	
	Total	Under Copyright	Total	Under Copyright
	1000x	1000x	1000x	1000x
Government	201,220	1,020	184,220	60
Education	53,540	13,570	715,430	62,170
Business	956,160	49,610	958,810	5,660
Libraries	8,350	5,450		
Total	1,219,270	69,650	2,858,460	67,890

67<

Consequently it seems reasonable to assume that most photo reproduction is of other than copyrighted works.

Further, it appears that technical journals (we use "technical" publication throughout to encompass all academic and professional writing) are the most commonly photocopied publications. This is to be expected because photocopying cost relative to the purchase price is lowest for this type of publication. Where the photo-copying cost is high relative to price, the benefit from photocopying and, hence, the probability of extensive photocopying is low. This is shown in Figure 1 below.

Photocopying Incidence and Copy-Cost/Purchase-Cost Ratio

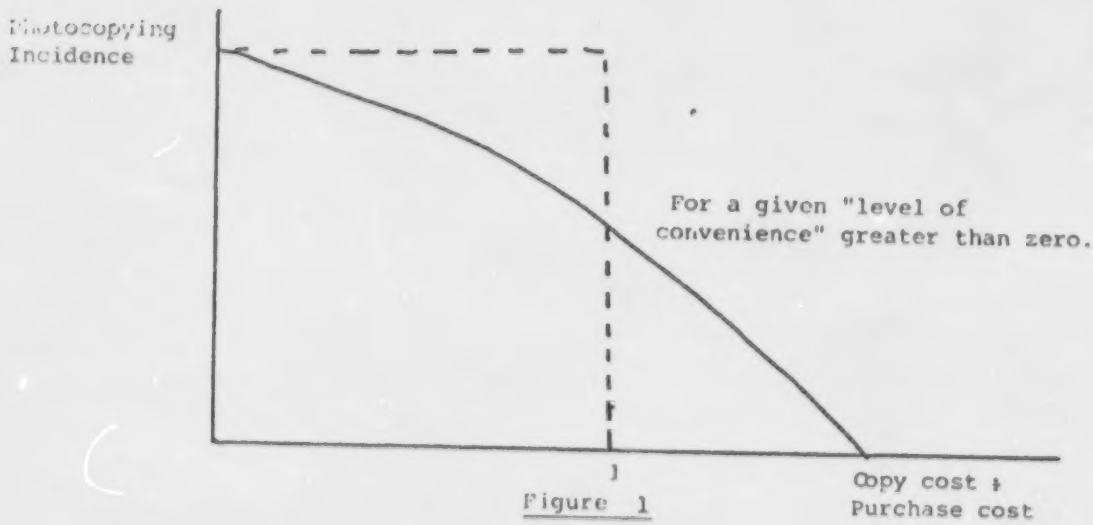

Figure 1

One might argue that the relation shown in Figure 1 should be discrete rather than continuous: That is, photocopying costs would always be either above or below purchase costs. At a copy/purchase cost ratio less than 1, one would always choose to copy. At a copy/purchase cost ratio above 1, one would always choose to purchase. The dotted lines and horizontal axis would then show this relation in Figure 1.

The reason this is not the case shown in the figure is that variables other than copy cost and purchase cost affect photocopying incidence and these have been held constant at a positive level in Figure 1.

Convenience of photocopying relative to purchase is probably the most important of these variables and this may vary among individuals. For example, at a low copy to purchase cost ratio everyone would find the convenience factor overwhelming and choose to copy. As the copy/purchase cost ratio increased, a few persons would choose not to copy for every (small) increase in the ratio until only very wealthy persons would choose to copy at high copy/purchase cost ratios. This explains the continuous nature of the graph in Figure 1.

Thus photocopying incidence is seen to depend primarily on three factors--copy cost, purchase (of book or journal) cost, and relative convenience of copying as opposed to purchase. Figure 1 shows two relations with one held constant. To give a concrete example, novels are rated less economical to photocopy than to purchase. Evidence on this suggests that, for books at least, purchasing prices average 1 1/2 to 2¢ per page.[3] The reason for this is fairly clear. It rests on a technological asymmetry in favor of publishers. This technological asymmetry in favor of the publisher also holds for offset printing and mimeographing or any other technology available to consumers. Hence, publishers' costs would be expected to equal or be less than consumers' cost of reproduction of entire works.

Unfortunately the analysis is not so straight-forward. Cost advantages do not lie entirely on the side of the publisher. There is a somewhat offsetting asymmetry in favor of consumers--namely consumers may presently photocopy without incurring royalty costs while this is not true for publishers. Further, users need copy only those parts of a publication in which they are particularly interested. Consequently although their costs of copying, per page copied, are higher than those of publishers their costs of copying what they want may be less than the cost of printing an entire journal or book.

With regard to technical journals, there is no possible cost advantage of purchase over copying when only one or two articles (or parts of articles) are to be copied. To some extent, the same is true of technical books in which it is likely that only small portions will be photocopied. It may well be true as well for a number of other kinds of printed matter, such as sheet music, pictorial or graphic material, costly newsletters. However, we found no relevant data on photo reproduction of such items.

Because of the cost differential just referred to, it appears that to the extent that photocopying affects the quantity of publication, its impact falls primarily on technical books and journals and possibly a few other categories. Photocopying all of a novel or non-technical book or magazine is simply too uneconomical to merit much concern.[4]

Restricting free photocopying would presumably increase the number of technical journals that could be published at or above cost and in this way could increase the number or size of such journals, increasing the number of published articles. This should increase the number of worthwhile ideas in circulation.

2. Purpose of Photocopying

A key question is whether photocopying is a substitute for journal purchase or whether it is a substitute for notetaking. If it is a substitute for journal purchase then at least some of the hypothetical advantages from photocopy restriction may be realized. Put differently, that photocopying be a substitute for journal purchase is a necessary but not a sufficient condition for directly increasing journal sales (and future creativity and consumption?) via photocopy restriction. On the other hand, to the extent that photocopying is merely a substitute for notetaking, photocopy royalties would have no effect on subscriptions.

This question readily boils down to an empirical issue: Is photocopying primarily a substitute for journal purchase or for notetaking? The empirical evidence is, however, very meagre at present, at least while some current research activities are completed. However, Line and Wood (1975) provide evidence on the question of whether photocopying serves as a substitute for journal purchase or notetaking. Their evidence indicates that in almost no case does photocopying serve as a substitute for journal purchase.

The answer to this question is so central to any policy remedy, however, that PIE-C strongly recommends that policymakers should not ignore it. Lacking hard evidence, CONTU members might ask themselves questions such as: "If I suddenly found that the option of photocopying (say) journal articles became less attractive (because of increased photocopying costs or for some other reason), would I resort to more notetaking or to journal purchase?" Conversely, "What would be my reaction if photocopying became more attractive

for some reason? Would this decrease my notetaking of journal articles or would it cause me to cancel current journal subscriptions and substitute photocopying?" "What would be the reaction of other persons faced with the same decisions?"

These are not trivial questions. To a very large extent, the facts on the use of copying in lieu of notetaking will determine the effectiveness of any policy remedies.

It is worthwhile to quote at length an authority on the subject. Dr. Gordon Williams, Director of the Center for Research Libraries in Chicago, cites his observation on coin-operated photocopy machines in libraries.

> "In my own observation, use of these machines, and indeed my own use, in lieu of any possible purchase is so rare as to be absolutely insignificant! They are primarily used in lieu of more time consuming, and inefficient notetaking by hand. I would suppose that most of you would agree that, indeed, this is most of your own personal use in the use of photocopying machines for copyrighted materials--notetaking.
>
> "This kind of use--in lieu of notetaking--I take to be fair use. But if the operation of these machines is to be stopped or hindered, I am confident that virtually no more book or journal sales would result. Or, if taxed for what is fair use (and without a monitor there to oversee each operation and forgive each fair use, this would be the result of a blanket charge) either this is unfair to the user, or it will inhibit his use, and waste his time and effort in the legitimate development and use of new technology."

Similarly, the available evidence indicates the number of people who faced with photocopying restrictions would subscribe to journals may be small. For example, many journals have few readers, hence, a person might occasionally photocopy an article from a journal but not subscribe to it, even if he could not photocopy.

Dr. Williams notes:

> "Several publishers, and I think specifically of the American Chemical Society and the American Psychological Association, have done surveys to discover the number of readers of the articles in their publications. The American Psychological Association found that the average number of readers was only 7 per article in their publications, and the American Chemical Society found the average to be only 10 persons for articles in their publications."

Speculating on a general explanation for this phenomenon, Dr. Williams notes:

> "Not many people use journals except, perhaps, for a few current general ones such as Science or Nature. What they use are articles in journals.

But the peculiar thing about periodicals is that you cannot subscribe to articles, but only to the whole miscellaneous collection of articles that constitute the periodical. In addition, you must subscribe and pay in advance without knowing what the articles will be about or who their authors will be. In effect, subscribers are being required to buy ten or twenty articles they are not interested in to get one that they are."[5]

C. EVALUATION OF PHOTOCOPYING RESTRICTIONS

1. Impacts on Producers

Three parties are directly affected by the degree of stringency in the application of copyrights to photocopying: authors, publishers and the "photocopying public" (those who do photocopying). In Chapter II, we indicated that the two stages of production consist of authors and publishers, for the most part separate and very different kinds of entities. In this section, we show that photocopying and charges for or restrictions on it are more likely to affect publishers and their output than authors and theirs. That either is substantially affected by photocopying is shown to be unlikely so long as photocopying is restricted to personal use.

In light of the fact that the existing evidence suggests that technical journals are the form of copyrighted publication most commonly photocopied the first question is the effect of photocopying on subscriptions. For the most part the same comments could be made about its effect on sales of books, although the magnitudes would presumably be smaller.

As was indicated in the preceeding sub-section, use of photocopying as a substitute for subscriptions (or purchase and a fortiori for resale could have an adverse impact on publishers revenues. Extensive use of photocopying for such purposes would deny publishers the opportunity to appropriate a portion of the benefits generated through their publications.

It was also shown that under present and at least near future technology, publishers have and will retain a cost advantage per page in producing copies of existing works. Further the existing evidence indicates that photocopying is not a substitute for subscription (or purchase) in the vast majority of cases. Consequently, although there might be some slight reduction in the production and circulation of journals it is likely to be small and there is no empirical evidence available so far as we know that such reduction has occured.

The fear has been expressed that photocopying might impair the financial strength of the publishing industry. There is no evidence to support any general argument along these lines. First, most of the

kinds of materials produced by commercial publishing houses are not widely photocopied (Appendix B). Second, the commercial publishing industry has prospered during the period of expansion of the photocopying industry. The industry has grown: its profits have risen.* The evidence seems to indicate that the industry is not suffering as a consequence of photocopying. The evidence would be more relevant and conclusive if the industry relaxed its secrecy and reported on a line-of-business basis. Third, a large portion of the types of journals most commonly photo-reproduced are published by not-for-profit organizations. In unpublished research done for CONTU, Dean Bernard Fry collected data showing that 31.6% of technical journals are published by commercial publishers. The remaining 68.4% are published by societies, university presses, and other non-profit publishers.[6]

Actual earnings of journals operating various levels of subscription sales are not known. However, there are a number of journals operating with very small subscription levels, less than 2,000, some with substantially less. For example, the Journal of Economic Theory and the Journal of Mathematical Economics are reported to have roughly 1,500 and 900 subscribers respectively. From this easily observable data it may be inferred that these journals are presently receiving revenues adequate to keep them operating and, for those that are not subsidized, it indicates that the minimum efficient size of a technical journal is small. If they were not receiving enough to cover costs these journals would not be published.

The fact that many journals are published by not-for-profit organizations, often as a benefit of membership in a professional association, means that for some the effective break-even point may be very low indeed. Consequently, it appears that most journals are operating considerably above the minimum efficient level for survival. To the extent that that is true, small reductions in their volume of subscriptions would not threaten their continuation.

More refined tests should be made to measure the effects of photocopying on technical publications. Such studies should control for varibles, in addition to photocopying incidence, which affect publishing

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* Cf. Standard and Poor's Industry Surveys: Communication. New York, 1976, pp. C90-C93.

revenues and profits over time. Changes associated with changes in competition might be one such variable. As already stated photocopying for resale could impinge significantly on publishers revenues. Further the existing publishers' cost advantage in reproduction of existing works could be eroded in the relatively near future, at least for copying progressively larger parts of whole books or issues of journals. Consequently, it is desirable to examine also the question of whether technological developments are apt to effect the producers' cost advantage. However, all the available evidence supports the conclusion that no large adverse effects of free photocopying appear to impinge on the publishers, even on publishers of technical books and journals which constitute the only vulnerable portion of the industry. Finally, free photocopying may add something to revenues of publishers by increasing library demand by users who photocopy parts of journals. Many of these users would not buy the journal were free photocopying not available to them.[7]

Conceivably adverse effects could accrue to authors of such works. The actual prospect of such result is patently small because there is no evidence that even increased photocopying would reduce sales substantially.

As discussed in Chapter II, authors of professional and related works appear not to be motivated substantially by the prospects of reward through royalties. First, their incomes frequently comes from other sources, university, industrial or governmental salaries or grants. Second, authors are often motivated by non-monetary incentives, interest in the subject-matter, personal recognition, increased opportunity for professional advancement, for example. Evidence that indirect monetary and non-monetary rewards from technical research often outweigh the direct monetary rewards from copyrighted publication is found in the preferences of academicians. Many of them, for example, typically prefer to publish in academic journals which pay no royalty and may charge a page fee, over publishing in books of readings which offer a small royalty or stipend. Most importantly, non-royalty related rewards from technical publishing are not reduced by unrestricted photocopying; if anything, they are increased, since photocopying increases dissemination of their works.

2. Impacts on Users and Consumers

It appears that may restriction on photocopying for personal use would have little impact on the total number of subscriptions (or book sales). Consequently, given the power to restrict such photocopying, the economically rational action for publishers would appear to be to establish royalties rather than to restrict such photocopying altogether.

Obviously, users of photocopies of copyrighted works would suffer a loss of income, income would be transferred from them to publishers. It is conceivable that receipts from new royalties would exert downward pressure on subscription prices. Under conditions of effectice competition there would be a tendency for this to occur as a consequence of some expansion of the number and size of journals. The question of how any new balance among level and structure of royalties, individual prices and institutional prices for subscriptions and books would evolve is complicated and is not central to the issues at hand. What is clear is that direct users of photocopying of copyrighted works would lose income to publishers. Substantial royalty income would, of course, permit the expansion of existing journals and the introduction of new ones. One of the potential benefits of increased production of technical journals, referred to above, is expanding the pool of referees. As stated in Chapter I, the consumer interest is often remote but real, in the issues at hand. This is a good example, increasing the number and kinds of worthwhile ideas in circulation should redound eventually to the benefit of consumers. However, the number of journals is so large now in most of the major technical fields that it seems unlikely that the benefits to consumers of increasing the number of referee pools would be significant.

There is another aspect of the efficiency of royalty payments. Introducing royalty payments would involve some very substantial administrative costs. The administration of a royalty system would require charging for each copy of copyrighted material but not, presumably for other copies: allocating the royalty receipts to producers; accounting and reporting. This appears to be a very complex set of tasks. The costs of carrying them out would appear to be very substantial.

The photocopy question has equity as well as efficiency implications. To the extent that the income and wealth of the users of photocopies of copyrighted materials is less than those of publishers, photocopy restriction will result in a more concentrated (and less egalitarian) distribution of income and wealth. For profit-making publishing firms, all photocopy restriction alternatives tend to have this effect, at least in the current period.

There are no data on the income or wealth position of users of photocopying, so there is no way of making a simple statement about the distributional effects of introducing payment for photocopying. However, it is clear that the costs of increased copying will be borne in the relatively near future by consumers as a group, and their income and wealth levels are less than those of stockholders on the average, and hence, presumably less than those of stockholders of commercial publishing houses. Hence, royalty payments tend to have undesirable equity consequences. Income and wealth distribution effects are unclear for the case of not-for-profit publishers and for any case of for-profit publishers who, for some reason, consistently subsidize particular journals.

The expected consequences of any increase in publisher revenues brought about by new royalties appear to be several. Publishers who were operating prior to the imposition of royalties would make windfall gains. For previously successful for-profit publishers these would be windfall profits; for some, such gains might permit continuing an erstwhile unprofitable operation. For non-profit publishers, they might permit expansion in otherwise economically infeasible areas or they might permit higher salaries for managers. For both there would be some incentives to expand output. To the extent that the relevant publishing market is competitive, the availability of royalties on photocopying would exert some downward pressure on future subscription rates. This would partially offset the stimulus to expansion, and reduce future windfall gains, but would leave the royalties on old issues of journals as pure windfall gains.

In examining another equity aspect an analogy may be instructive. Most library users use a desk when reading the material of publishers. To a large extent, use of the desk makes reading of the publishers' materials

easier. If forced to use (say) journals only in libraries and if forced to stand (or sit on the floor) while reading them, patrons would be far more likely to give up on library journals and purchase their own journals. As a result, one might question whether libraries should rent out desk space to journal users and return this rent to publishers.

If this were done, competitively priced journals published after the "desk charge returnable to publishers" were imposed, might be priced lower. The sum of desk charges plus the lower journal price would then return the competitive profit to publishers. To publishers who earned the competitive return (profit) prior to the desk charge, however, the desk charge would represent a pure windfall to publishers.

Since any refunds on the purchase price of journals purchased prior to the royalty arrangement is unlikely, royalties on these (old) journals would represent a pure windfall to publishers (one which expects no downward pressure on prices).

The point of the above analogy is that redirecting revenues from photocopiers to publishers is a somewhat arbitrary choice. Users of any item indirectly connected to publisher output (e.g. journals) could be redirected to publisher profits with the same logic.

The possibility that net benefits will occur from restricting (charging for) photocopying is much less clear than is the timing of these benefits. Benefits to users from photocopying access occur in the period in which the copying takes place. However, benefits to most consumers--technological or other intellectual advances--occur only in the future, possibly the distant future. This is important because there is strong evidence that people prefer consumption in the present to consumption in the future. This increases the net benefits of unrestricted photocopying. How much present consumption is preferred over future consumption can be determined by use of a rate of time preference which may be taken as being equal to the discount rate. The higher the discount rate--i.e., the greater the society's preference for satisfaction now rather than in the future--the less the value today (present value) for any given future benefit.

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Finally, it is conceivable that the nature of research will vary depending on the degree to which photocopying is restricted. If the cost of photocopying were to rise substantially research might be of a different type from that performed if photocopying remains fairly accessible. With restrictions, returns to publishers and some authors of intellectual works, such as books of readings, can be expected to be greater. However, returns to authors--especially non-monetary returns--of technical articles would be slightly less. The amount of their expected loss would depend on the amount of their returns from non-royalty sources -- e.g., from recognition, from grants and from the tenure/non/tenure decision in academic institutions. To the extent that through unrestricted photocopying authors are made more dependent on grants, government, industry or foundations may gain more control over the research activities and over the orientation of authors who derived a greater portion of their incomes from royalties on copyrighted works. This is not thought to be a very important point and is mentioned here more or less in passing for the sake of completeness.

Finally, even in the unlikely event that photocopy restriction could make some marginal difference in the type of research conducted, it is not clear whether more non-governmental research would result in a greater social benefit than other research that might benefit from low priced photocopy accessibility. Nor is it clear whether an increase in subsidies would lead to greater or less academic freedom. Thus, it may be possible to say something about the slight effects on types of research from photocopy accessibility. It is very difficult, however, to say what are the effects of increases and decreases in these types of research on the general good or the social welfare.

3. Overall Impacts

There is a basic problem of economic efficiency relating to the extension of royalty charges for photocopying copyrighted works. It is more fully developed in Appendix A. One can think of two separate sets of activities or "sectors", publication and photocopying.

Permitting publishers to impose a royalty on the photocopying of their copyrighted works would increase the cost of photocopying. That would deprive users of photocopiers (for this purpose) of some of the value (consumers' surplus, in technical terms) to them of photocopying that material. Similarly, it would tend to appropriate revenues of providers of photocopying services. Providers of photocopying are not solely manufacturers of hardware; the service installations where machine reproduction is provided for sale or for"in-house" or library use are the actual providers of the service. Although the percentage impact on photocopying (as well as offset and stencil copying) would apparently be small (Section B above) in absolute terms they might be substantial, especially in the future. The royalty would constitute an increase in the cost of photocopying, tending to increase its price and to reduce the amount of photocopying service produced and consumed, as well as reducing the producers and consumers surplus (net benefit) in that sector.

These sums would be transferred to publishers. The transfer would occur despite the fact that the photocopying service requires many inputs in addition to the copyrighted materials themselves and despite the fact that if the photocopying is not a substitute for purchase, it is performed at no cost to the publishers.

The increase in publishers' revenues can best be thought of as equivalent to a reduction in the (net) cost of producing the type of publication involved. A decrease in the price would, under conditions of effective competition, tend to increase output in the publishing sector, benefiting both customers and producers in that sector.

The output of photocopying services would tend to be decreased, that of publication increased, resulting in a misallocation of resources. Only in the event that in the status quo ante publication levels were below the socially optimal amount could the conclusion be reversed. It is impossible to determine whether the level of publication is at, above, or below the socially optimum level. However, if publishers are failing to appropriate a large portion

of the benefits they create, there is a tendency for publication to be too little in social terms. A key question, then, is whether publishers have and use adequate alternatives to royalties as a means of appropriating the value of their product.

D. ALTERNATIVES TO ROYALTIES

There is an alternative way of compensating publishers for their full cost of production and facilitating the appropriation of a large portion of the benefits created through publication of copyrighted works, namely price discrimination.

The basic rationale for price discrimination was sketched out in Chapter II-D. Here it is appropriate to point out that price discrimination may, to a large extent, overcome the difficulties of non-appropriability in photocopying of publishers' output: by charging higher prices to e.g., libraries for non-appropriable multiple use than to individual subscribers for fully appropriable use. Similarly higher prices can be charged to other institutions (e.g., business and government) which distribute publishers' output to multiple users and create non-appropriability difficulties.

As already indicated, a large portion of photocopying is copying of technical journals in libraries and other institutions. Obviously more people typically want to use a library's copy of any particular journal than want to use any individually subscribed journal (usually one person presumably). An institution's demand for a journal subscription can be thought of as a monetary expression of the cumulated wants of all the library clients who want (use) the journal. A price change of any given (absolute) amount tends therefore to be smaller relative to the total income of the demanders of institutional than of individual subscriptions. This tends to make the institutional demand less elastic than individual consumer demand. As a result the publisher can charge a higher price to the institution than to individual subscribers.

If prices were set on the basis of long run marginal cost adjusted in accordance with the inverse elasticity rule, if libraries (and other institutions) dealt with publishers on an arms-length basis, and if there were effective competition in the relevant portions of the publishing industry, revenues of publishers of photocopied materials would move toward the optimal level.

A quick empirical check shows that price discrimination is widely used. The subscription price of many technical journals (and of some books) is higher to libraries than to individual subscribers. This would not be rational were library demand for journals not less elastic than individual demands. Library demand would not be as inelastic (and possibly not as high) as it is now were the photocopying option not available to library journal users.

It is possible to formalize the publishers' calculation of revenue-maximizing price discrimination. This is done in Appendix C.

However, it is important to note that commercial publishers are not entirely free to discriminate between institutional and individual subscribers: postal rules prohibit their use of class-two permits if price discrimination exceeds two to one. Non-profit publishers are free to discriminate without such constraint. As mentioned above a recent study showed 68.4 percent of technical journal publishers to be non-commercial publishers.

Although there is no way, at least without extensive empirical study, to determine whether virtually all the benefits would be appropriated by a combination of price discrimination and charging royalties on reproduction for sale, it is clear that a large proportion of them would be. The fact that there are a large number of the type of journals most vulnerable to competition from photo reproduction as well as the fact that publishing in general is flourishing, indicate that enough of the benefits currently being produced are captured to provide a virile source of printed information.

E. IMPLICATIONS FOR POLICY

The general conclusions of the analysis presented in this chapter indicate that CONTU should not recommend any further restrictions on photocopying beyond those that are included in the 1976 Act and that fair use should be formally defined to include photocopying and similar reproduction for personal use. The basis of this recommendation and a summary of the major and minor arguments for both sides of the issue are summarized below:

Major arguments against expanding restrictions on photocopying of copyrighted works

1) Photocopying royalties shift revenues from the photocopy "sector" to the publishing "sector" and in this way misallocate resources. That is, persons seeking convenience (a substitute for notetaking) wind up paying for publishing output under royalty schemes, which was not their intention.

2) Substantial administrative costs are involved in any royalty scheme.

3) A method currently exists for allowing publishers to recover most if not all non-appropriable costs from non-paying users of published works (principally library users) and not exclusively photocopy users. The method is price discrimination, by which publishers charge institutions more than the individual subscription rate.

4) The size of the minimum efficient scale for journal subscriptions is small. Therefore, large publisher outputs are unnecessary to sustain existence of a large number of technical journals. The fact that most technical journals are subsidized strengthens this argument (and allows for a small minimum efficient journal scale size).

5) Publisher profits are healthy and not currently in need of being revived.

6) A royalty system would be likely to generate windfall gains to publishers from three sources:

a) Even if publishing is highly competitive some windfall gains will accrue to existing publishers during the period before the competitive market adjustment is being accomplished. Some of the publishers who were operating before the change would retain windfall gains permanently.

b) To the extent that the publishing industry is not effectively competitive increased revenues from price discrimination via a royalty system would not be entirely offset by corresponding decreased revenues from price discrimination via different institutional and individual subscription charges.

c) Royalties to publishers from photocopying of pre-royalty publications would involve pure windfalls to publishers unless a system is set up to make refunds on the subscription price to previous purchasers of journals--which is unlikely.

7) Increased future creativity from royalties or other photocopy restrictions are questionable, at best. This is largely because authors of technical works--which have the greatest photocopy incidence--would not get significant royalties from such publications nor are they motivated to any large extent by the pecuniary rewards flowing directly from their technical publications.

8) In many cases, the economics of photocopying are outweighed by the economies of publishing. In these cases, it is more economical (cheaper) for a user to purchase a publisher's output rather than to copy it.

9) Any royalty system is likely to have very large administrative costs associated with it. These are deadweight losses borne ultimately by consumers.

Minor arguments against additional restriction

1) Easier photocopy access may increase the ease of future creation because of the increased accessibility of source materials for authors.

2) Any potential benefits to consumers from photocopy royalties and their restrictions occur in the future, mostly in the distant future. A positive social discount rate is desirable to promote egalitarian inter-generational income transfers. This makes present consumption more desirable than future consumption and argues for less photocopy restriction, thereby favoring present over future consumption.

3) Any royalty scheme results in a redistribution of resources from consumers to publishers. To the extent that the income of consumers of photocopiers of copyrighted works is less than the income of stockholders of publishing houses (which is likely) photocopy royalties result in a less egalitarian (more concentrated) income distribution.

Major arguments for restricted photocopy access (through a royalty scheme or some other mechanism)

1) Future creativity and output may be increased as a result of more technical journals being published and possibly larger remuneration and incentives to authors. This is to be contrasted with minor argument #1 for unrestricted photocopy access.

2) To the extent that photocopying is a substitute for purchase of publishers' output, a photocopy restriction (and/or royalty) will result in better resource allocation among sectors in the economy.

Minor arguments for restricted photocopy access (through a royalty scheme or some other mechanism

1) A royalty scheme would increase non-government-subsidized output which might reduce governmental influence on creativity.

2) If future creativity and publishers' outputs are increased, this may increase the future supply of photocopiable materials and increase demand for future photocopying. This effect may somewhat offset the decline in quantity demanded of photocopiable materials as a result of photocopying royalties.

Finally, there is a question of whether it is desirable to try to legislate now to handle future technological developments. Photocopying technology is advancing rapidly, changing the availability and cost of reproduction outside publishing houses.

The intent of Congress seems to reflect a "cross-one-bridge-at-a-time" attitude by requiring periodic review of the provisions of Section 22 every five years.

CONTU testimony, however, is not without queries concerning future technology. In most cases, the emphasis is on the subject of the need for more and more stringent photocopying restrictions now.

The dangers of presently legislating against the vaguely perceived threats of future technological change are seldom discussed.

Two considerations mitigate against imposing restrictions in the present to forestall future contingencies. First, once a governmental function is established that grants monopoly status to any set of suppliers, a vested interest in the perpetuation of that status builds up. That economic interest provides resources for perpetuation of the position, even after any social

justification for its initiation has long past. Second, commercial interests can be counted on to press vigorously, and with ample resources, for any protectionist action that would benefit them as soon as the situation changes so that they are threatened by new developments. Consequently, it would appear appropriate not to recommend any restrictions greater than the minimum required to meet current conditions.

CHAPTER III

FOOTNOTES

[1]Letter dated June 22, 1977 to Public Interest Economics Center from Robert W. Frase, Assistant Executive Director and Economist CONTU.

[2]Letter of June 22, 1977, cited above.

[3]Economic Council of Canada, Report on Intellectual and Industrial Property, (Ottawa: Information Canada), 1971.

[4]Ibid

[5]Gordon Williams, CONTU Testimony, October 1976, pp. 128-129.

[6]Letter from Frase, op. cit. above.

[7]CONTU Testimony, October 1976, pp. 128-129, op. cit. above.

APPENDIX A

OPTIMAL PRICE DISCRIMINATION

A large proportion of photocopying of technical publications is done in libraries. Technical publishers are aware of this and are able to price discriminate by charging higher subscription rates to libraries than to the general public. In fact, if publishers have knowledge as to the incidence of photocopying of their journal, they may (and possibly do) estimate revenues lost from library photocopying. This is estimated by the publisher from considerations such as frequency of journal photocopying times the probability that photocopy restriction would result in an additional journal sale. This equals the number of lost journal sales as a result of library photocopying. Multiplying this number by price per journal yields gross revenues lost as a result of free library photocopying = GR. Publishers are free to raise prices to libraries somewhat. Doing so would tend to recover revenues lost through library photocopying.

What would be the revenue maximizing price differential? The answer depends upon the new demand curve which is generated by libraries.

The price of individual subscriptions depends upon the demand for subscriptions by individuals. Here $q_i = f(p_i)$ represents individual demands where i refers to the i^{th} subscriber, q = number of journals sold and p = the journal price.

In the case of libraries, $q_e = g(p_e)$; $p_e = h(\sum_{i=1}^{n} q_i)$, where e refers to the e^{th} library. Hence, in the case of libraries, demand for a subscription at each library depends upon demand by the n individuals who demand the publication from the library.

The important point here is that more persons want a library journal than the number of persons who demand any individually subscribed journal. Therefore, the quantity demanded of a library journal is much less subject to price fluctuation (less elastic) than is demand for an individually subscribed journal. As a result, the publisher can charge the library a higher price for the journal than he can charge an individual user.

Some library users are, presumably, persons who would buy the journal had it not been available to be photocopied. The switch of these persons from individual subscribers to library users does not result in a loss to the publisher equal to the revenues they would have paid the publisher from subscribing defined as "GR" above. Rather, it is equal to "GR" minus additional revenues the library is able to earn as a result of marginal individual subscribers (persons who would not subscribe were the photocopy and library option available) entering the library photocopy market and increasing library demand for the journal. Call this additional revenue "AR". The difference is equal to net revenues resulting from a switch from individual subscription demand to library demand called "NR" = GR - AR. The sign of NR may be positive, negative or zero, depending on all the factors mentioned above.

It is important to recognize that it is unlikely that NR = GR. If AR is greater than zero, publishers would not lose from photocopying an amount equal to the loss of subscriptions from persons who choose to photocopy rather than to subscribe.

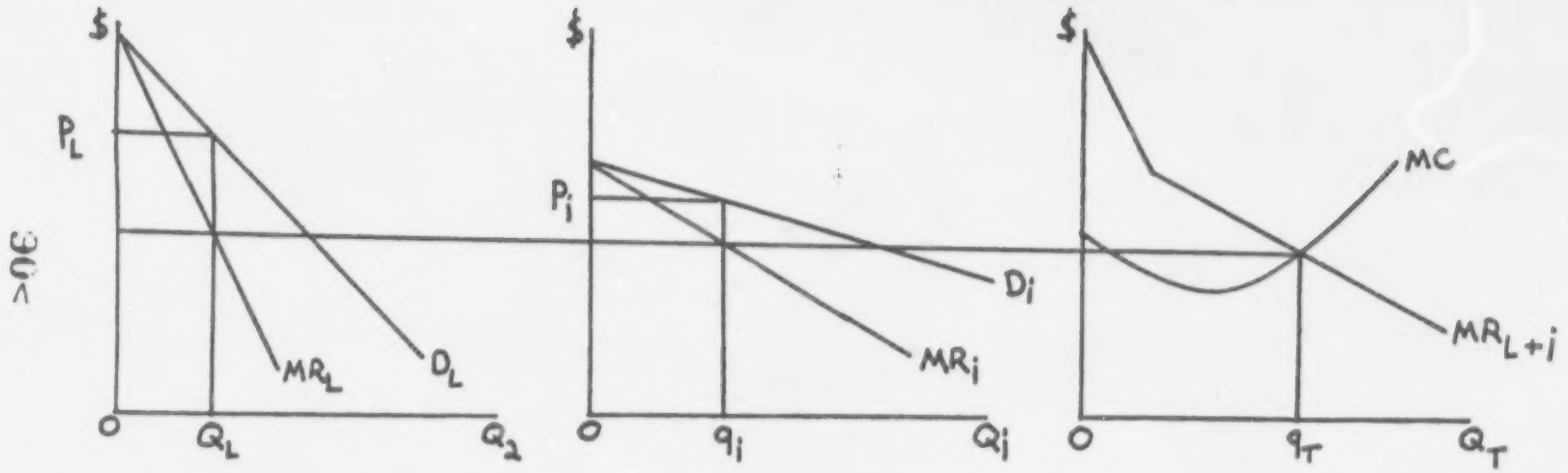
For readers so inclined, this model of "reduced adverse effects to publishers as a result of photocopying by library users contributing to price discrimination opportunities for publishers" is shown in the graphs in Figure 2.

Explanation of Figure 2

First, it should be pointed out that individuals switching from market i to market L did not necessarily increase demand but likely made it more inelastic. Compare graphs showing "library" and "individual subscription" markets in Figure 2. This is because increased library demand for a journal's use will not necessarily result in more journals ordered by the library but will result in more use of (photocopying of) the existing journal(s) owned by the library. This is especially true if journals are for library use only.

Profits of the publisher are maximized where the last journal sold in the individual market adds as much to total revenues as the last journal sold to libraries; that is, where the marginal revenues in the individual and library markets are equal.

Publisher Price Discrimination Between Library and Individual Subscription Markets



Library Market, L

Individual Subscription Market, i

Sum of Markets L + i

Figure 2

To accomplish this, the marginal revenue curves of the two markets are summed horizontally, giving combined marginal revenue function MR_{L+i} in the far right panel of Figure 2. MR_{L+i} is equated to marginal cost MC, indicating the optimal output q_T. To equalize marginal revenue in each market at the profit maximizing value, we construct a horizontal line from the point where $MC = MR_{L+i}$. The optimal output in each market is found where this horizontal line intersects the markets' MR function, and the profit maximizing price is found by reading off the relevant demand function the price at which the optimal quantity is demanded. This gives the pictoral explanation of the theory behind the observation that the higher priced O P_L is optimal in the less elastic library market and the lower priced O P_i is optimal in the more elastic individual subscription market.

Once again, the moral of this story is that publishers reap new gains as well as suffer new losses when increased photocopying (even with no royalty charge) results in decreased individual journal subscriptions and increased library photocopying. The loss results from a decline in (individual) subscriptions ($\downarrow q_i$). The gain results from less elastic and possibly higher library journal demand resulting in price and possibly quantity increases in the library journal market. ($\uparrow P_L$, possible $\uparrow Q_L$). (See Figure 2.) Net effects are uncertain, but are probably less than the gross loss effect ($\Delta p_i q_i$) and may even result in a net increase in publisher profits.

An Impediment to Market Self-Regulation

A problem with the price discrimination solution is that institutional factors prevent it from working to the degree it might work if unencumbered. Currently, U.S. law prevents more than a 2:1 ratio of prices charged institutions vs. individuals for journal subscriptions. The penalty for violating this law is loss of the second class mailing privilege. This is no small loss and nearly all technical journals keep within the 2 to 1 pricing rule in order to keep their second-class mailing privilege.

It may be desirable to re-examine the rationale for the 2 to 1 pricing rule in light of the social advantages of price discrimination. Allowing

price discrimination to work in a less encumbered fashion would increase the viability of the market vs. government as a regulator of photocopying of copyrighted works. Suggesting re-examination of this pricing rule may lie on the periphery of the area of authority and responsibility of CONTU.

APPENDIX B

THE PUBLISHING INDUSTRY:

EMPIRICAL DESCRIPTION

A. SIZE AND COMPOSITION

As shown in table 3, publisher's receipts have grown steadily throughout the first half of this decade and preliminary figures indicate a continuation of this trend.

TABLE 3

Publishing Industry Sales 1971-76

Year	Sales ($ Billions)	Percent Change from 1971
1971	2.9	———
1972	3.0	3.4
1973	3.1	6.8
1974	3.5	20.6
1975	3.8	31.0
1976p	4.6	58.6

Source: extracted from American Association of Publishers Report and Publisher's Weekly 6/76

In 1975 12 billion copies of books were distributed: this is roughly 5.5 books per capita. These billion-plus copies were composed of 39,372 new and revised book titles. (This means that there was an average of about 30,500 copies of each title). 16% of all titles were in economics and sociology, while 10% of all titles were fiction. 1976 figures are not yet available.

These statisties together with the data on stock market value and profits of the publishing industry indicate that it is a profitable and growing industry and has remained so during the period when photocoping became a major activity.

B. ROYALTY PAYMENTS & MARKETING EXPENSES

Publishing industry analysts typically divide the industry into six major divisions: Mass market paperback, College textbooks, Elementary and High School textbooks [EL-HI], Trade books (fiction & non-fiction; juvenile and adult; hard and soft), Professional and Book Club. Consolidated accounting statements are available for each of the above divisions. Of particular interest to CONTU were the data presented on royalty payments in each division as a per cent of net sales. New sales are gross sales minus returns and allowances. Royalty payments are those monies paid to authors for the primary rights to their work. Sometimes publishers also purchase subsidiary rights which allows reprinting, translations, syndication and the like. Subsidiary rights are important in only one division--trade books.

Table 4 shows royalty payments for primary rights as a percent of net sales for each division.

TABLE 4

Division	Royalty as % of Net Sales
Mass Market	29
College	15.2
Trade	13.7
Professional	10.1
El-hi	6.0
Book Club	6.0

More detailed statistics do not reveal any systematic variations in royalty payments either by firm size or profitability.

Within trade publications, 20% of the sampled firms recieved 91% of the income from subsidiary rights. Normally the publishing house and the author split the subsidary revenues (after expenses) on a 50-50 basis. There are exceptions. The publishers' share from juvenile books is typically 66%, while the authors' share from adult paperbacks averages 60%.

Marketing expenses fall into two catagories, selling expenses and promotion. In general they are expenditures made by the publisher to attract or

capture the attention of a prospective buyer. There is a relationship between marketing expenses and royalty payments. This is portrayed in Table 5.

TABLE 5

Relationship between Royalties & Market Expense

Royalties as % of Net Sales	Market Expense as % of Net Sales
Book Club (6.0)	Mass Market (7.8)
El-hi (6.0)	College (14.4)
Professional (10.1)	Trade (15.6)
Trade (13.7)	Professional (16.9)
College (15.2)	El-hi (20.8)
Mass Market (29.0)	Book Club (35.0)

In general high royalties are paid to those authors who can penetrate markets with a minimum of marketing support. Conversely, high marketing expenses--such as book clubs where the publisher creates and organizes a market--mean low royalty payments. Simple linear regression techniques indicate that for every $10 increase in marketing expense, royalty payments decline $7.36.

What this means is, publishers pay writers not for the quality of the ideas nor for the potential impact on the human condition but for the writers' ability to attract the attention of prospective buyers.

C. DISTRIBUTION CHANNELS

The most important book distribution channels are shown in Table 6.

TABLE 6

1975 Distribution Channels

	Gross Revenues ($ billions)
General Retailer	1.1
Direct mail	1.0
El-hi stores	.7
College stores	.7
Libraries & others	.4
	3.9 billion

Very little photocopying is to be expected along the two major distribution channels, general retailers and direct mail. There is, simply, no opportunity. El-hi stores and college stores similiarly offer little if any opportunity to photocopy or tend to be excluded by the face-to-face teaching clause.

Libraries and other institutions are expected to be the major places where copying will occur. These channels account for only about 10% of all sales.

The above expectation about the location of photo copying is based on two considerations:

> there is more ability to copy at the library because of the presence of self-service, coin-operated machines and
> there is more interest in doing so because books distributed thru libraries tend to be more expensive than those offered thru other sources. Evidence on this second point is contained in the following table.

TABLE 7

Revenues per unit by Channel

Channel	$/unit
Direct Mail	5.84
Library	4.97
College store	4.30
El-hi store	2.55
General Retail	2.53

D. MARKET POWER

There are two places where market power may arise, between author and publisher and between publisher and consumer. PIE-C focused on market power because with increasing concentration of economic power, prices tend to rise, output to be reduced and resources tend to be used inefficiently.

Theoretically market power exists whenever the elasticity of demand is less than infinity. As a practical matter, economists inspect the cross-elasticity of demand and concentration ratios to test for the presence of significant monopoly power.

Concentration ratios are computed by dividing industry sales into the sales of the some of the largest firms in the industry. The shares of the 4 largest or 8 largest firms are often used.

Below, table 8 portrays concentration ratios for five categories of books. These catagories unfortunately differ from those used earlier. Textbooks include both El-Hi and college; technical compares rather well with professional; and religious, general and reference make up the Trade, Mass Market and Book Club categories.

TABLE 8

Concentration Ratios in Book Publication

Product	Percent of sales by 4 largest	Percent of sales by 8 largest
Textbook	33	54
Technical	39	57
Religious	36	51
General	29	47
References	71	82

Source - Census of Manufactures 1972

It is clear that the greatest concentrations occur in the reference-work area. Furthermore the 8 largest firms control over half the market in all but one of the product categories.

It is useful also to recall that revenues from subsidiary rights are concentrated in the hands of a few publishers.

The relationship between author and publisher is more problematic. authors are free to seek any publisher from among those who publish in their field. Once an author selects and is selected by a publisher no further competition takes place. The terms of the author-publisher relationship vary but patterns do emerge. As noted above in general author-publisher terms are strongly related to marketing considerations. If an author can attract attention he/she will receive higher royalties.

- o The publishing industry is financially healthy and growing with no-fee photocopying.
- o Consumers spend 4.6 billion dollars a year on books

- Royalty payments are strongly related to marketing strategy
- Subsidiary rights are not important in 5 or 6 categories
- 10% of all books are distributed thru libraries
- Photocopying is likely to occur in libraries
- some monopoly power may exist in the publishing industry, especially in the reference category.

Determining Optimal Photocopy Restriction

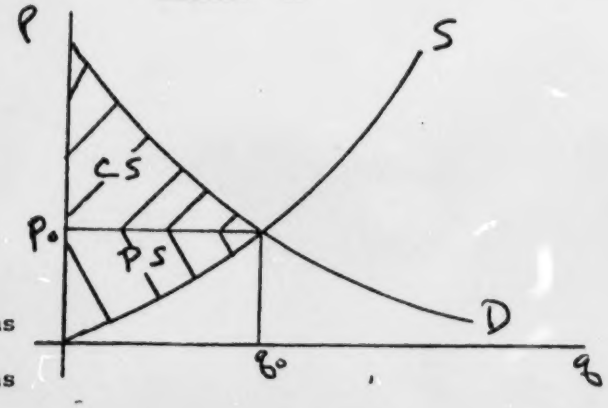
The theoretical framework for determining the optimal amount of photocopy restrictiveness is set forth below. This framework determines optimal price and quantity of photocopying, price and quantity of journals and the optimal photocopy charge (royalty). The theoretical framework shows how these price, output, and royalty levels would be determined. That is, it shows the data requirements necessary for their determination. Data requirements are supply and demand elasticities for publishers' outputs in general and photocopied materials in particular as well as total dollars spent for publishers' outputs and for all photocopying.

The theoretical framework itself does not (without the above data) tell the optimal photocopy charge. Very importantly, it does not tell whether the optimal charge (royalty) is positive or negative. A negative royalty would imply publishers' subsidization of consumers' photocopying. It is an important result of this theoretical framework that in absence of any particular empirical restrictions, the case for consumer subsidization of publisher profits (via royalty or some other arrangement) is not more compelling than publisher subsidization of consumer photocopying--an option not considered in the public debate.

Consumer and Producer Surplus

Analysis of consumer and producer surplus is another approach which may be taken to analyze the photocopy issue. By this approach, policy makers seek to maximize the sum of consumer and producer surpluses. Consumer surplus is defined as the additional amount consumers would be willing to pay for the product. Producer surplus is defined as producer profits. These concepts are shown graphically below in the supply and demand diagram:

Figure 3



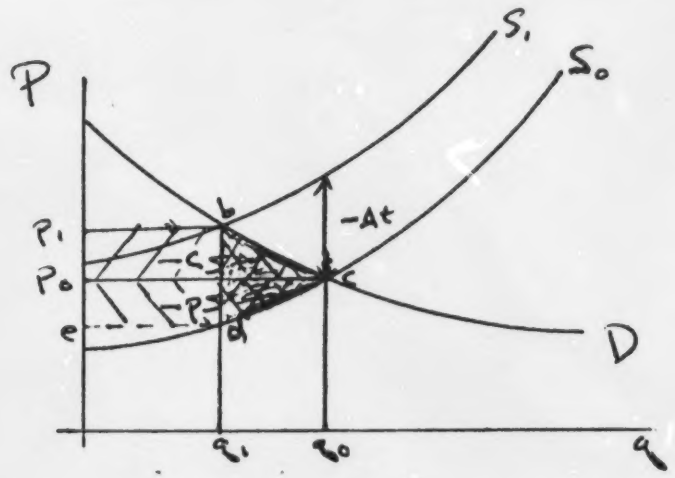
CS=consumer surplus

PS=Producer surplus

Supply and Demand for Photocopy Service

The demand curve above represents demand for photocopying of journals. It is in equilibrium at P_o Q_o. If a per unit royalty on each use of photocopy service is imposed, it will shift the supply curve from S_o to S_1 as shown in figure 4.

Figure 4

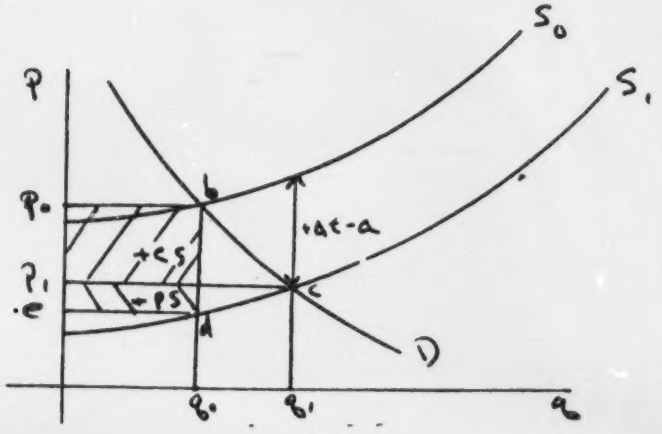


The area marked -cs shows the loss of consumer surplus. The area marked -ps shows the loss of producer surplus. The rectantles, -cs and -ps show revenues flowing from persons who phtocopy (consumers) and photocopy manufacturers (producers) to publishers. The darkened triangle is known as a "dead weight loss" or "excess burden". It is equal to the net loss of consumer and producer surplus. That is, it is equal to the loss of consumer and producer surplus which is not offset in some other sector (e.g. offset by increased revenues of publishers). This is the net loss which results from the photocopy charge. (If the supply curve were perfectly elastic, all the loss would be borne by consumers.) The size of the loss depends only and entirely on supply and demand elasticities as well as the size of photocopy revenues from copyrighted materials. Desirability of photocopy charges therefore, turns entirely on these empirical data.

From the point of view of the publisher, the royalty on photocopiable materials may be treated as a subsidy. This may be shown as a positive shift in the supply curve from S_0 to S_1. In the diagram 5 „ the entire

amount of the tax is not transferred from photocopy users who pay (-) ΔT to publishers since publishers receive (+) Δt-a. "a" is equal to transactions costs which are involved in administering the photocopy royalty program. This analysis assumes that administrative costs (a) are deducted from royalty revenues prior to their transfer to publishers. The increase in producer surplus of publishers and consumer surplus (excluding consumers who photocopy) for users of publishers' outputs is shown below in figure 5.

Figure 5



Supply and Demand for Publisher Outputs

As a result of the photocopy royalty equal to Δt-a, publishers produce q, of output and sell it at price P_1. The gain in consumer and producer surplus is shown by the area p_o b c d e. This analysis considers long run supplies, when all inputs are variable. It also considers in the supply curves discounted future effects on creativity and output -- which might be positive or negative as shown in the photocopy discussion section.

To determine net effects one would subtract from p_o b c d e in figure 5 , the area p_1 b c d e in figure 4 . If the difference is positive, one would conclude that photocopy royalty charges increase consumer and product surplus and are worthwhile. If the difference is negative, one would conclude that these charges are not worthwhile.

It seems desirable to set forth this framework since the results of this analysis indicate the information which is necessary to answer the desirability of photocopy charges.

Although the data are not easy to come by (supply and demand elasticities for photocopies in particular) they may not be impossible to come by. Industrial organization literature has attempted a number of estimates of the dollar size of the dead-weight loss which results from the presence of monopoly power in the U.S. economy. A parallel study of useable accuracy net dead weight loss which would result from a photocopy surcharge may also be feasible.

CHAPTER IV

SOFTWARE

A. THE PRODUCT AND THE INDUSTRY

1. Description of the Product

Computer software may be defined to be a set of instructions designed for use by a computer to perform specific functions. Software, or computer programs, may be divided into a number of different categories, depending primarily on the closeness of the "language" employed to ordinary human language-source, compiler, object program, etc. The closer a language comes, in the several stages required, to stating the instructions in a form that actually can be used by the computer to carry out tasks, the less it is recognizable or comprehensible to a human reader.

Software can be represented in a number of different forms, including written listings, tapes, discs, silicon chips, and temporary storage within computer memory. "Hardware" is generally taken to mean permanent circuitry which is purchased as a physical machine unit rather than in a form that is easily reproducible by users and transferable between machines. However, the distinction between software and hardware may be becoming increasingly difficult to make, as intermediate forms of storage take hold in the field. The relevant distinction for this study seems to be made by considering as software anything that can be conveniently reproduced [or examined for content], by a user without the necessity of going back to the provider.

Software is the major area at present where the separation between protecting expressions and ideas is a matter of concern. While all communications contain ideas as well as expression, it has (possibly incorrectly) been considered that the value of non-physical intellectual work could be adequately protected by means of protection of the expression alone.

The nature of software, with its primary intent being communication with a computer (or through a computer to humans) which cares nothing about style or expression, tends to bring out more clearly the fact that the work may contain both detailed, tedious successions of steps and

innovative programming ideas. (It has been pointed out that in, for example, programming for education use, the intent is not only communication with the computer but also with a student.) For present purposes the significance of the distinction is that, as discussed in Chapter II, materials that communicate ideas but are heavily dependent for their value on expression have been subject to copyrights while physical entities and the design of new material products, where the uniqueness lies in the idea rather than in its mode of expression, have been subject to patents.

The fact that these ideas, when translated into simplest program form, actually perform the operation of a computer leads to the possibility that new software falls into the realm not only of communications (copyrights), but also to that of physical product innovations, which if novel could be subject to patent. CONTU Commissioner John Hersey has argued that programs, as amalgams of writings and processes, are appropriate for neither copyright nor patent protection and should therefore be protected by a mechanism specifically designed for them.

It is unclear what the division in commercial value is between the detailed expression contained in a program and the novel ideas or processes, if any, (also known as algorithms) developed for that specific piece of software. Any such division probably varies from one program to another to a degree which can not be known in advance. Most observers seem to believe that a high proportion of the value is, in general, due to the former--the expression--[1a] component.

For public policy towards protection, the significance of understanding this distinction is that specific innovative algorithms can possibly be copied or initiated for commercial use by examining a program or by passing on the ideas from one programmer to another. On the other hand, for the typical lengthy program, making use of the details is probably only worthwhile if an actual copy can be obtained and run or reproduced. This has implications both for what protection (if any) is theoretically adequate, and for the practicalities of enforcement.

2. Present Industry Structure

Data on the software industry are difficult to evaluate unambiguously, because of overlap in statistical categories, lack of product-line reporting by firms selling both hardware and software, and the large amount of programming which is done for in-house use, and hence, is never sold.

Looking, first at purchases: In 1976 U.S. computer users spent $38.4 billion in total computer usage, of which $20 billion (52%) was computer goods and services, $10 billion (26%) was user salaries, and $8.4 billion (23%) was user overhead.[2] Another source gives data by user industry and by cost component of total data processing expenditures. Hardware ranges from 33 to 46 percent of total costs, depending on the industry. Internal personnel costs, a large proportion of which is presumably in-house software development, ranges from 35 to 54 percent of total expenses. "Packaged software," meaning programs purchased externally and separate from hardware, constituted only 1.3 to 3.5 percent of total data processing costs. The portions of such programs bought from the "mainframe" (hardware) manufacturer versus independent software firms varies tremendously by industry, with more than 2 to 1 ratios in either direction.[3] A different estimate concluded that of $30.99 billion spent on electronic data processing (EDP) in 1976, only $1.72 billion was for "software packages/facilities management."

If in-house developed and separately purchased programs are lumped together, one calculation shows that the proportion of total computer costs accounted for by software has risen dramatically in recent years, to an estimated 75 percent currently.[4,5] But of an estimated $12 billion in software expenditures, an overwhelming proportion was done in-house, rather than through package buying.[6]

Turning to producers: Total worldwide revenues of U.S. computer manufacturing and service firms were $31.9 billion in 1976, of which $26.6 billion was for computer equipment and supplies, and $5.3 billion was computer services.[7] Worldwide hardware sales constituted about $12.8 billion of the total.[8] Software sales were approximately $840 million--less than 3% of total revenues-- in 1976, up substantially from $500 million in 1974.[9]

Revenues in the data processing industry are highly concentrated, with the top 6 firms accounting for about 75 percent and IBM alone

controlling 50 percent of the market.[10] Another source shows that of 1976 total revenues for U.S. EDP systems manufacturers of $18.4 billion, IBM has 60.2 percent, with the other seven significant producers ranging from 7.9 percent down to 2.9 percent of the market.[11]

Independent software producers are clearly highly competitive among themselves, with 1972 figures showing (although they are difficult to interpret) more than 1500 firms in the industry, and the top 46 firms (those with sales over $50 million) probably receiving less than one-fifth of the total revenues of independents.[12]

Unfortunately, we have not been able to obtain data showing the share of the software market held by hardware manufacturers (IBM et al), who are, of course, typically orders of magnitude larger than the independent software firms. Without requirements for product-line reporting by corporations, this important information for determining competition in the industry is difficult to arrive at. One indication is the large fraction (mentioned earlier) of software purchases made in many industries from "mainframe" manufacturers. Another, possibly misleading, bit of evidence is the dominance of IBM and Burroughs in copyright registrations of software, of which they have about 75 percent between them.[12a]

Thus, the picture of industrial market structure is obscure. The hardware industry is highly concentrated. The software industry is characterized by a very large number of relatively and (absolutely) very small firms, but the huge hardware companies are also in this market to an unknown degree with, one suspects, major monopolistic advantages.

There is remarkably little data on the process of soft-ware innovation, who does how much of it, in what institutional setting, for what motives. It is obvious that some is done in many settings ranging from secondary school pupils through industrial and governmental research, developmental and operational activities to the most advanced centers of scientific exploration. Further, there are some individuals who believe that future technological developments will permit individuals to do some programming useful to themselves and potentially valuable to others in their own homes. It is also obvious that much of the commercially available programming is created by private corporations, software houses and manufacturing firms. The supply of innovative programs from software firms appears to be directly dependent upon the expected software innovation. Hence, the

aggregate supply of new software is obviously responsive to prospective monetary gain. Consequently our analysis, based on the assumption that protection is at least one major instrument for encouraging production of new programs, appears to be well founded.

3. Projections of Technological and Market Structure Changes

One forecast of total expenditure by computer users has it rising from 3.2 percent of US GNP in 1975 to 5.2 percent in 1980 and to 8.3 percent in 1985.[13] CONTU gives a projected growth rate of 20 percent per year for the independent software industry. A projection by a market research firm has software sales rising to $3.5 billion by 1984, a four-fold increase from their estimate of $840 million in 1976.[14]

Software is expected to constitute a continually increasing share of total ADP costs, as high as 90 percent by 1985.[15] While most programming is currently done in-house, this is expected to change greatly, as independent software companies increase their share of total employment of computer specialists from the present 15 percent to about 50 percent.[16]

CONTU's data project a continuing trend towards more rapid growth by independent software producers than by hardware manufacturers, possibly implying increasing competition in the industry. Other observers, noting the many small firms and rapid entry into the market, believe that software development will buck the trend of most industries, remaining an unconcentrated "cottage" industry. However, there is by no means total agreement on this forecast:

> "Today, there are more than 400 independent suppliers of software in the U.S. . . . Which of the 400 will survive the next 10 years is the big question. Even a casual observer would agree that a big shakeout is coming. Just as in other aspects of our industry, software has attracted hundreds of small entry companies which will eventually dwindle down to 10 or 20 key firms."17

Technological progress is occurring at a rapid rate in the hardware field, as costs continually fall and miniaturization, including the development of "mini"- or "micro"-computers, remains a major trend. According to CONTU testimony, progress in the efficiency with which software is written, however, appears to be slow. Techniques remain relatively primitive, based largely on individual skill, and observers do not project much change in the foreseeable future.

The trend towards falling costs and miniaturization, plus other qualitative evidence, suggests that computers will not only constitute an increasingly large share of national income, but will also begin to enter substantially into direct consumer-goods purchases in such areas as entertainment, education, and home appliances. Changes in computer and programming technology may also make possible a degree of do-it-yourself programming by consumers.

B. PROTECTION OF SOFTWARE

1. Present Means of Protection

Protection of proprietary rights or privileges in software is sought and attained in a multiplicity of ways. Copyrighting of software was first allowed in 1964 but, even since that date, has not appeared to be the dominant form of protection. The major means appear to be various forms of contractual provisions.

Data on the utilization and effectiveness of presently available protection for computer software are limited. A survey of practices for protecting software property was undertaken in 1972 by Harbridge House The data obtained in that study show that the vast majority (77 percent) of firms responding to the survey use contractual licenses or leases, with a "confidential disclosure" provision. Fifty-one percent of firms believe these arrangements are either "very" or "completely" effective, with another 23 percent saying they are "somewhat" effective. The other modes of protection all overlap greatly with this dominant category; trade-secret licenses, copyrights, and "physically limiting access to technology" all being employed by a majority of respondents. These three categories were all viewed as having similar effectiveness, with 49 percent or more saying each was a least "somewhat effective." Other modes were used relatively little, with patents in particular employed by only 3 percent of the firms.[18]

Of the respondents, only 13 percent (four companies) could think of any instance in which inadequate protection was a barrier to the development of programs representing a "significant level of innovation."[19]

A study done in Sweden (probably in 1974) found that of 77 firms surveyed 45 percent reported having experienced infringements of proprietary rights in software.[20]

The figures on use of copyrights for protection must be regarded with caution. From 1964 to 1977 only about 1200 programs had been registered, with varying forms of deposit, with the Register of Copyrights. While the vast majority of registrations were from only two companies, IBM and Burroughts, the reported "use of copyrights" reflects simply the placing of a copyright notice on all marketed copies of the software. Under present law such notices entitle a firm to protection; registration need be made only prior to bringing an infringement suit. As it is virtually costless to file notices, and since no copyright infringement suit for software has yet been brought, its effectiveness must be regarded as largely speculative, depending on the belief that notices have some deterrent effect.

2. Problems in the Existing System

As noted, the limited survey evidence available gives only slight support to arguments that lack of effective protection hinders software development. Interpretations of the data must be ambiguous. While only 13 percent of firms could cite specific instances of hindrance, if the "contractual licensing" category of protection is regarded as encompassing all the others, then a few firms (3 percent) felt protection was "not at all effective" with 23 percent regarding it as only somewhat effective. Judging from the rapid growth of the software industry in recent years it is clear that there is plenty of profit to be made despite any difficulties in maintaining proprietary rights, although it cannot be proven that growth might not have been even faster under different circumstances.

One major reason why current protection appears to be adequate in most cases is that a large portion of "packaged programs" are either custom-developed or are designed for limited, specialized markets. In turn part of this specialization is due to non-standardization of hardware, with each different type requiring software designed specifically for it. Second, "physically limiting access to technology," may, where used, make it impossible to violate non-disclosure provisions. Third, the data discussed earlier show that packaged software is currently used almost exclusively as an input into production processes (defined broadly) not as a final consumption good, and that it constitutes a very small percentage of total ADP costs. For a firm which has purchased

use of software, and another wishing to obtain use without going to the manufacturer, to seek each other out and come to an agreement involves breaking a valid contract and putting a great deal of effort into arranging the transaction. It seems that in most cases the possible reduction in costs is simply not worth the trouble and the risks of a suit for contract violation.

A number of reasons have been alleged as to why the prevailing system of confidential-disclosure/trade-secrecy contracts is not entirely satisfactory, despite the apparent health of the industry:

- o arranging and enforcing contracts involves substantial "transaction costs," raising the prices to buyers, reducing supply of software;
- o contracts currently fall under different state laws, which are not uniform and make it more difficult to write and enforce agreements;
- o because non-disclosure provisions can fail, the risk to sellers of incurring losses is substantial, tending to reduce innovation;
- o the need for maintenance of secrecy tends to steer producers away from general-purpose and mass-marketed software, towards specialized programs which face less risk of disclosure;
- o as opposed to a copyright system where the item would be deposited and could be examined, buyers have difficulty in comparison shopping and, hence, necessarily have inadequate information on which to base purchasing decisions;
- o the "ideas," "processes," or "algorithms," contained in innovative programs are not protected, on the other hand;
- o secrecy means that not only are the expressions involved kept under proprietary control but disclosure of general programming ideas is inhibited, impairing innovation through building one program on another.
- o the term of protection is unregulated and, thus, if contracts are effective the term is unlimited;
- o maintenance and enforcement of secrecy agreements appear to have "economies of scale," so that large producers can use them more effectively than small ones, tending to create concentration within the industry.

3. Alternative Policies

The principal alternatives for federal policy towards software appear to be:

- o status quo: continued protection via state common-law regarding trade secrecy contracts, provisional availability of copyrights according to the 1964 decision of the Register of Copyrights;
- o trade secrecy under state law continued, copyrights not allowed;
- o trade secrecy under state law continued, availability of federal copyrights formally enacted by Congress;
- o federal trade secrecy law replaces state law, copyright availability enacted;
- o federal trade secrecy law replaces state laws, copyrights not allowed;
- o copyright availability enacted, trade secrecy banned;
- o no protection-state laws allowing trade secrecy banned, copyrights not allowed;
- o any of the above options, with patents made available for those programs meeting the criteria of utility, novelty, and non-obviousness--(all options except this one assume no patents);
- o new form of protection for software--difficult to characterize, as there may be numerous possibilities--one example would be a modified patent, in which there would be protection for "ideas" or "algorithms," but no ban on independent development;
- o any of above options, with expanded federal subsidies for some types of software development, which would then be in the public domain.

Besides the long list of alternatives, there are several variable characteristics of the forms of protection which may greatly affect their impacts: First, there is the term of protection granted under any form of protection for software; second, the type of deposit/degree of disclosure required under copyrights; third, the practical effectiveness of the mechanisms available for enforcing copyrights, particularly for small producers; fourth, any of the alternatives could be implemented along with other measures designed to limit the costs of monopoly power that occurs in the industry. Protection could be denied to firms which have substantial monopoly control of the relevant market; compulsory

licensing could be instituted; or antitrust action could be taken to split up dominant firms. There is an obvious problem in making recommendations in this area, in that it might be very difficult to tie together a federal system of protection with provisions for anti-monopoly action.

C. COSTS AND BENEFITS

1. Trade Secrecy and Copyrights

Evaluation of alternatives revolves largely around an evaluation of the degree to which the present system is operating non-optimally, a subject on which there is much controversy. Above we listed, without comment, the reasons why the predominant mode of protection, non-disclosure contracts, has been argued to be undesirable. Examining these arguments adequately requires data which for the most part are unavailable, so our conclusions are in all cases tentative.

It has been argued that the costs involved in maintaining proprietary rights through non-disclosure contracts under common law are a fairly small component of the costs of developing and marketing software. While we have no hard evidence on this subject, current conditions in the industry suggest that, at least at present, this statement is correct. To the degree that it is, the hypothesis, that large firms have an advantage in using secrecy agreements, is of less importance.

The same memo states that non-uniformity among state laws is an insignificant barrier to marketing by software firms, one reason being that for practical purposes the laws are, in fact, fairly similar.[21] We have found no contrary evidence, but this remains a subject for investigation.

The survey data previously cited, while ambiguous, appear to indicate that the present system, in part due to the types of software being produced, performs reasonably well although the risks involved to producers, of disclosure and loss of investment, may be significant enough to warrant concern.

All of the above applies to current conditions, and may not hold as rapid changes occur in the industry, particularly if mass-market programs become a reality on a large scale. It has been argued that the customized or restricted-market nature of most software means that protection

is relatively easy to maintain.[22] What will happen for more general-purpose programs is unclear. The likelihood of copying would seem to be much greater. On the other hand, to reach a large market, such programs will have to sell at relatively low prices, which may make the inconvenience and stigma of illegal copying outweigh the savings to the user. An analogy with phonographs and audio tape recordings may be appropriate here, as the market for records and tapes appears to flourish despite the ease of making unauthorized recordings. More difficult to evaluate at all is the degree to which software firms may be dissuaded from entering the mass-market field because of its (possibly) higher risks of disclosure.[22a]

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To continue the analogy, it does appear that copyrights could perform a valuable function for mass-market software. As we understand them, non-disclosure contracts can only apply to the original purchasers of a software package, and it seems infeasible to require such contracts for software packages sold at retail. Without copyrights, there would be no legal prohibition against a firm's mass-producing "stolen" programs, purchased at retail. In contrast, in the case of contraband records and tapes the threat of copyright infringement suits presumably provides some deterrent.

Returning to current conditions, it is not clear that copyrights would alleviate any of the other hypothesized drawbacks of trade secrecy listed above. Copyrights <u>are</u> presently available, yet are not relied upon, one must assume because they are viewed as ineffective, or no more effective than private contracts. Under present circumstances, copyrights and non-disclosure agreements essentially duplicate each other, with no evidence that availability of clarified copyright protection would significantly reduce transaction costs or the risks of unauthorized reproduction. Unless some change occurs which would make copyrights easier to enforce than contracts, they do not offer any important advantage to producers. CONTU has pointed out that with copyrights there is "availability of (a) statutory damages, (b) attorney's fees from infringers," which between them might make infringement suits a marginally (or substantially?) more viable option than contract violation suits.[23]

Another suggestion is to provide publicly-supported legal assistance for small producers who bring infringement suits.[24] While potentially

valuable, this last possibility involves difficult questions of implementation and governmental bureaucracy, which we do not go into here.

On the other side, we do not see that availability of more stringent copyrights would have any important costs. As an alternative to private contracts, they cannot provide any more restrictive protection than do the latter, and would not appear to provide any greater opportunity for monopoly power than does trade secrecy. The option of using either or both forms of protection should simply mean that a firm would use copyright if it believed that would reduce its transaction and/or enforcement costs.

It might also be possible to make copyrights clearly available while banning trade secrecy for any software covered by copyrights. If the two forms of protection are essentially equivalent this would lead to little change from the status quo. To the degree that private contracts can be written which are more effective than copyright law (greater penalties, technological constraints, etc.) the elimination of non-disclosure agreements would increase the risk to producers (assuming no monopoly power in the industry--see below). There are also constitutional questions in banning private parties from entering into contracts freely agreed upon.

We can identify only two possible substantial advantages of copyrights over trade secrecy:

First, if banning non-disclosure contracts can be legally implemented, use of copyrights could greatly limit the term of protection (see below) if that is desirable.

Second, a copyright statute could require disclosure/deposit of enough identifying material that while the entire programs could not be copied, the ideas--algorithms--could be examined and passed on, possibly directly encouraging innovation through greater sharing of knowledge. It appears that programs which are currently registered have various forms of deposit, enough for identification purposes, but we are unclear as to whether algorithms can be deduced. Whether the disclosure of innovative algorithms is desirable is another question (again, see below).

The "no protection" alternative is one in which we can see no net advantages, as per this paper's introductory discussion of the non-exclusivity characteristics of information. We doubt that prohibiting

all protection is legally possible, and if done it could only have harmful consequences on the supply of software.

2. Competition and Monopoly

Clearly our arguments have been based on the assumption that protection is desirable from the standpoint of consumers. In Chapter II, we showed that consumer interests are best served by the maintenance of proprietary rights, as long as there is effective competition in the industry. Available evidence indicates that this is indeed the case among independent software producers, although we lack evidence on the role and power of the hardware manufacturers in software markets. While more empirical work needs to be done, on balance it appears that, whatever their historical dominance, the hardware corporations lack the ability to control entry into the software market, and that their market shares are being steadily eroded by the independents. Thus, we can tentatively conclude that protection of software, at least for the independent producers, serves to benefit consumers by enhancing competition and increasing long-run supply. For the hardware manufacturers, or any independent software firms which have a substantial share of the market, it is doubtful whether protection is in the interests of consumers.

However, should conditions change in the future (see C. Projections of Technological and Market Structure Changes), with the software industry becoming subject to control by a few firms, other actions (in our view preferably -- anti-monopoly legislation and enforcement) would become necessary. If such action is feasible, effective protection would still be desirable (see II.G, Regulation and Antitrust Action). Should effective anti-monopoly action or regulation of some form prove infeasible, it would be necessary to reconsider the nature and extent of protection.

3. Term of Protection

The term or duration of copyright protection is, as discussed in Chapter II, an important component in the value of a copyright to its holder. The longer the term, all else equal, the larger the amount of income potentially transferred from customer to producer on the particular item in question. To recapitulate, the social justification, if any, for such a transfer is that only the expectation of such transfer (profit) will induce some potential producers of innovative software to produce it. In light of the fact that there is substantial risk that any innovation

will fail, i.e., return to its innovator less than the costs incurred, a steady flow of innovation is impossible without either subsidization or protection.

Regarding the optimal term of protection there are difficulties in arriving at any satisfactory conclusion. Economics of Property Rights As Applied To Computer Software And Data Bases (see II. E. Basic Trade-off and Term of Protection) concludes that, under most conditions, the term of protection should be shorter than the expected commercial life (average useful lifetime) of a unit of software. Given the usually (at present) short period before which programs become obsolete, this suggests a period of protection for software much shorter than that traditionally given to written works, possibly only one or a very few years.

On the other hand, on the basis of our analysis, one would find that in effectively competitive markets for software, the term should be as long as the period of commercial usefulness. With effective competition, denying payments to the original producers on software sold a few years in the future does not reduce monopoly profits under competition (there are none). (See Chapter II.) Thus, a short period of copyright protection would mean reducing innovation in software below the level that is optimal in terms of consumer interest.

If optimal policy requires that the copyright be effective throughout the commercial life of a software item, that implies that, under conditions of competition, there is no simple justification for any terminal date at all on the copyright: once an idea is of no commercial value there is no substantial cost to society of not having it freely available. There may be non-substantive costs in permitting anyone to have the power to restrict access to anything that is not of commercial value. Hence, a position that copyrights should be valid in perpetuity would be false.

The picture changes dramatically if there is substantial monopoly in the software market. If there is monopoly, the availability of copyrights, especially in the absence of trade secrecy, would serve to strengthen monopoly positions. The longer the duration of the copyright the greater that effect and the greater the transfer of income from customers (ultimately consumers) to the monopolists. The economically preferred remedy would be not a reduction in the term, but rather removing

should be used to evaluate it, we will attempt no complete examination of their validity and importance.

The House Subcommittee on Patents, Trademarks, and Copyrights reported:

> "From the social point of view patents are not an ideal means of encouraging inventive effort. They may come into the hands of firms which, technically, are less advantageously equipped than their competitors to use the invention. The patentee may have investments in competing technology or in competing lines of manufacture which make it temporarily unprofitable for him to employ an invention which his competitors would exploit immediately. More fundamentally, patentees, since they enjoy a degree of monopoly power, are unlikely to exploit inventions to the extent warranted by their usefulness to society, and may be overcompensated in terms of their costs. Production by any monopolist is likely to be at a lower level, and his prices higher, than would prevail if the industry were competitive. Moreover, the production policies of a monopolist are likely to leave some opportunities unexploited, thus forcing other productive resources into socially less useful lines of manufacture, or to work with inferior technology."[25]

The critical factor which distinguishes patent from copyright protection is the ability to gain monopolistic control over an idea--a physical design, process, or other innovation. Unlike a copyright, a patent prevents anyone else in the entire community which is bound by the law from utilizing the same ideas, no matter how important, and no matter whether developed totally independently of the patent holder. To take one example close to the subject at hand, it has been estimated that in 1967 Xerox Corporation, holder of a patent on their dry-copy process which was (and is) far superior to any others available, was making more than 1,000 percent profit on its machines, selling copiers for $29,500 that cost $2,400 to manufacture.[26]

While we do not explore the historical roots of patents, and although it is true that public policy is in many cases in part due to inertia, the continued widespread acceptance of the patent system gives some indication that it is socially valuable. There is an apparent trade-off between the economic benefits from innovation and the economic costs of granting monopoly power to exploit individual inventions."

Two considerations relate more directly to our specific interest in the possibility of patents for software. First, there is a prohibition under patent law that "laws of nature and mathematics" shall not be subject to patent rights. This is obviously one means by which it is intended

monopoly power or, possibly, regulating the prices charged so as to provide only a competitive rate of return. If such action were impractical, a reduction in the term would be of some benefit.

Another difficulty with the conception of a short term is the need for using an average of commercial viabilities. Since there is likely to be substantial variation in the commercial life of programs and particularly valuable innovations may have unusually long economic lives, an average will give unsatisfactory results for many if not most programs. Of course, if our reasoning in regard to the desirable policy under effective competition is correct, this difficulty is irrelevant.

In light of the fact that there appears to be substantial competition among the independent software producers but a very substantial degree of monopoly in computer manufacturing, it would appear to be appropriate for hardware manufacturers or any of their affiliates to be ineligible to obtain copyrights on software. A more complex rule would be that no hardware producer with more than some small share (say 5 percent) of the market would be eligible for normally available copyright and trade secrecy protection.

4. Patents

Our discussion so far has centered on the desirability of protecting the expressions contained in computer software, and in fact we have suggested that a desirable feature of copyrights over trade secrecy might be the disclosure of the ideas or underlying logic of programs, which would aid programmers in building on each others work. However, the reverse argument can be made, that the promotion of software innovation requires that proprietary rights be given to their producers. To some unclear extent trade secrecy presently does protect basic programming ideas, performing much of the private function (as contrasted to social function) of a patent. Objections to patent protection can be divided into two categories--those applicable to patents in general, as a very restrictive form of protection, and those which depend on the characteristics of software as a specific form of innovation.

To object to patents in general means, obviously, to make a more general criticism than is the subject of this paper. While quite valid, it is beyond the scope of our work to do a complete cost-benefit analysis of the patent system. While we will state some of the criteria which

to restrict patents from creating great social costs. Depending on the exact interpretation, it may be that this provision would eliminate a large portion of innovative programming sequences from patent consideration. This would appear to be socially desirable.

Secondly, it has been pointed out that the greatest social costs from the patent system occur when there is a concentration of patents in the hands of one firm or a few firms. In such cases the firm may gain substantial control over the direction of research and technical change in the field, and may seek to maximize its own welfare at large cost to society.[27] Here we return, not to monopoly control over one piece of creativity, but to the problem of dominance of an industry by one or a few firms. In the software industry, despite the apparently large degree of competition, the position of IBM and other hardware firms is certainly such as to warrant concern over concentration of patent control if patents were made available for software.

In sum, while there does appear to be a socially valuable function to be performed by the awarding of patents for innovative algorithms or other programs, the evidence suggests that there are great risks in doing so. With the evidence now available to us, we can reach no conclusions on this subject.

5. Other Alternatives

It has been argued that computer software represents a form of intellectual product which is not analogous to writing and other forms of communication and to artistic expression, and thus should not be given standard copyright protection. We do not agree that there is any "cultural" danger involved in the availability of such protection, as we can see no reason why the fact of software and cultural works coming under the same form of protection should either (1) degrade cultural work in the eyes of society, or (2) harm the traditional protection for cultural works.

On the other hand, we agree that software does appear to be different from other "new technologies" (broadcast music, etc.) which have been historically given copyrights, due to its dual nature as both a writing and a mechanical process.[28] Our consideration of both copyrights and

patents for software confirms its unusual characteristics. We see no objections to putting software in a separate title of the copyright law, particularly as this might simplify giving it a non-standard term of protection (if desirable) and setting up special deposit requirements for copyright registration. Whether an entirely new form of protection is desirable depends on what that new form is, and we have not yet seen a promising alternative. Our example stated earlier, of a modified patent which would protect ideas but not ban independent development has important theoretical advantages: it would allow innovators to reap some rewards from their own work, but not from precluding rewards to others through simultaneous development. Unfortunately, it does not appear to be feasible, because proving whether a second developer had done the work independently would probably be a next-to-impossible job.

6. Public Subsidization

Development of computer software, analogously to other forms of research or development, may in some cases have benefits which are not closely enough related to commercial usage, or are too large in scope for individual firms to undertake, to be done by the private sector [29] (see II. L. Public Subsidization). If the potential benefits to society are substantial, it may be worthwhile in many cases to give public support to needed research, despite the drawbacks of allocating funds through the governmental process. It is also important to ensure that a program of public support is not simply a disguised subsidy for an industry or particular firms which would have done the work anyway for their own purposes.

D. POLICY RECOMMENDATIONS

Our limited data both on present conditions in the industry, and more so, on likely future technology and market structure, necessitate that our conclusions be regarded as tentative and subject to modification as further evidence emerges.

The present system of contractual licensing is operating with reasonable success, although not optimally due to variations between state laws, transaction costs, some degree of risk of theft and the possibility of excessive constraint on new software development because no disclosure of any sort is required. To the extent that the software industry is

competitive, the more important features of secrecy--(1) unlimited term of protection, and (2) some degree of exclusive control of programming ideas, would seem to be desirable. Non-uniformity of relevant state laws does not appear to be a serious enough problem to warrant federal action, especially if copyright protection is strengthened.

Under present conditions copyright protection is only marginally valuable to producers. However, it may generate some social benefits in that it would probably be used largely in cases where it would involve lower transactions costs than would trade secrecy. Further, it has negligible costs to society so long as trade secrecy is available. It may become an important stimulus for the development of mass-marketed software, which may be of relatively large benefit directly to consumers. The appropriate term of protection, we have argued, should, under effective competition, cover the full period of commercial usefulness.

All of the serious disadvantages of copyright protection arise with or are greatly exacerbated by the existence of monopoly power. Consequently, the major concern of public policy is with the degree of actual and potential monopoly power in the software market.

Patent protection, or some new form of protection, may be desirable alternatives (or patents could be available along with copyrights/trade secrecy), but much further research is needed before any such action should be taken.

Our recommendations are:

1) For independent software firms not in control of a substantial portion of the market, continued use of non-disclosure contracts should be allowed.

2) For these same firms, copyright availability should be formally enacted, probably under a separate title of the copyright law, but with the term of protection still equal to or longer than the expected commercial life of most software.

3) Research should be done to find methods of making copyright protection more effective (enforceable) for small copyright holders.

4) Research should be undertaken immediately to ascertain the extent to which hardware manufacturers have monopoly power in the software industry or are likely to develop it.

5) Measures should be taken to eliminate the existence and danger of monopoly power in the software field. In decreasing order of desirability these measures are:

a. denial of trade secrecy and copyrights to large hardware manufacturers,

b. statutorily forcing hardware manufacturers to spin off their software operations,

c. antitrust litigation to force hardware manufacturers to divest themselves of their software activities and to split up any (future?) software firms with major market power,

d. compulsory licensing with regulation of prices, holding profits down to competitive levels.

6) Research should be undertaken to ascertain whether there are general operationally useful criteria for the federal subsidization of software innovation.

Chapter IV
FOOTNOTES

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CHAPTER V

COMPUTER DATA BASES AND COMPUTER-CREATED WORKS

A. DESCRIPTION OF THE PRODUCT

Computer data bases are, in general, compilations of information "data" taken from one or more written or observational sources and stored in (or prepared for storage in) a computer memory in a systematized way. The organization of the data within the computer is designed so that retrieval of particular categories of information desired by users is rapid and efficient. Data bases may be regarded as analogous to various well-known material sources such as bibliographic indexes, social science abstracts, and encyclopedias. The major advantages of computerized systems are that (1) through use of programming instructions, the computer itself can perform, at a great savings in time, an information search that would otherwise be done by hand, and (2) the data files can be rapidly updated or expanded by inputting new material and deleting old material in the computer memory.

Access to, or output from the computer may be in several different forms, including standard paper copies, microform, or on-line electronic access, the last of which is probably the most common. Data bases may be roughly categorized into three classes: bibliographic, statistical, and specialized. Bibliographic bases contain citations or abstracts of professional or other technical literature in one or in a variety of fields. Statistical bases consist of masses of data, such as financial statistics, and usually have facilities for high speed access and sophisticated analysis and graphical display. Specialized bases exist for a wide variety of applications. Examples include real estate listings, airline schedules, books in print, technical tables, and information on business and consumer credit ratings.

In this chapter we consider the proprietary rights involved both in input into the computer and in output. Inputs into data bases may be characterized as having one or both of two valuable properties--(1) the content of the material is useful, such as would be the case for an entire journal article or other manuscript put into computer memory, or (2) the

organization of the material gives it its primary value, such as for a bibliographic index, in which the individual entries are public-domain information.

For the former case, output from the data base would normally be in the same form as the input, with the source clear. For the latter case, however, the information is likely to be rearranged within the computer, items from several or many different sources may be combined in one output listing, and the sources of the output may be unrecognizable.

In relation to proprietary protection, it is clear that both the sources of the information and the firm operating the data base have an interest in the output, regardless of whether the material is put out in a form totally different from the original. Only the sources of information have any proprietary "right" at risk on the input side.

Output whose value lies largely in the reorganization of the data done in the computer can legitimately be considered a new product or creative expression, potentially subject to protection. We will evaluate the likely effects on consumers of such protection, but will not evaluate non-economic arguments over whether such output constitutes "derivative" or "original" work in some legal sense. Such distinctions are not relevant to the impacts on consumer welfare of alternative policies.

Similarly, in this chapter we consider the purer case of "computer-created works," by which we mean those not derived at all from other copyrighted material.

B. PRESENT INDUSTRY STRUCTURE AND PROJECTIONS

Very little quantitative information is readily available on the computer data-base industry. Relevant to our analysis are both the providers of data bases themselves and the sources from which they draw their data. Computer data base vendors use a broad range of sources, including individual journals, hard-copy data bases, indexes, newspapers, and public-domain material put out by the government. Qualitative evidence indicates that for many of the journals and, in particular, for a large proportion of the comprehensive indexes, the publishers of the hard-copy possess a large degree of monopoly power in selling to computer data-base operators. In many cases there are only one or two sources of information which have been arranged in the needed manner, (for example, Social Science Citation Index and Moody's or Dun and Bradstreet). Also, it appears that one or a

few firms control a major portion of the entire indexing market.[1] For a number of the journals and some reference works the publisher is a non-profit professional society, which may not be attempting to maximize profits. However, for-profit firms are probably the major force in the industry (see data in Chapter III. Photocopying). Further, a not-for-profit organization living within a limited budget or trying to minimize its deficit, may operate very much like a profit maximizer.

At present the on-line bibliographic computer data base industry is highly concentrated, with two firms controlling most of the market (Lockheed and Systems Development Corp. [SDC]), with only one other significant firm in existence (Bibliographic Retrieval Services, or BRS). Specialty data bases are operated by a number of other firms, including the New York Times and several legal reference services. There are also a few data bases put out by non-profit firms, and major reference bases provided by the government, including MEDLINE. Observers report that, despite the high levels of concentration, there appears to be at present effective price competition among the few firms involved, in at least a large portion of the categories of data base usage. In some cases, however, certain data bases are available from only one company.

It should be noted that Lockheed, SDC, etc. are generally known as "wholesalers," while their sources are actually referred to as data base proprietors. These sources are often not originally in machine-readable form. Often they are not derived from copyrighted works, but are developed directly by the data base firm. While each base, in general, has unique features, there appears to be a substantial degree of competition among them.

The continuing rapid decline in hardware and other computer costs, and the increase in demand for easily-accessible information, indicate that the on-line computer data base industry should enjoy rapid growth. It may be that more specialized data bases will be developed with the possibility of competition from firms with expertise in specific areas. However, for the near future it is unlikely that there will be any new large-scale entrants into the on-line market which would challenge the dominance of Lockheed and SDC.

In such a new and volatile field it is risky to make projections, but the nature of data-base services suggests that the industry is likely to

remain one with high initial, or fixed costs, and consequent substantial barriers to entry. We may surmise that monopolistic tendencies will be a continuing problem. However, the degree of monopoly power that will be exercised is unknown, particularly in light of the potential for market control that currently exists but apparently is not being fully used. There are a number of prospects in this connection. The existing large participants may not be charging full monopoly prices for any of several reasons. They may want to discourage new entrants, seeking to maximize long-run rather than immediate profits. SDC with its origins as a not-for-profit corporation may still have some technocratic, rather than profit maximizing, motivation in its management. Lockheed with its history of being repeatedly buoyed up by government contracts and support in largely non-competitive markets may, similarly, be less vigorously profit seeking (and more security-seeking) than a firm whose history is characterized by participation in free enterprise markets. The degree of future concentration in the market will depend on the growth of the market and the growth of the present suppliers. As the market grows, it is possible that they will have difficulty in retaining their dominant market shares.

C. PRESENT MEANS OF PROTECTION

Publishers of journals, reference works and written data bases have available to them standard copyright protection against use of their materials by computer data base "wholesalers." Because computerized information vending is a highly visible, public business, and since the materials used are re-sold to the public, there is not at present much opportunity for computer firms to evade paying royalties to their sources or meeting any other conditions for use. Hence, at the stage of transfer from data base/written index to computer-information vendor there is apparently a well-functioning system for protecting the property interest of data suppliers. Typically the copyright holder receives a percentage royalty on the sales of the wholesaler. In some cases where the publishers of data bases are abstracting journal articles or other materials there is a question as to whether royalties should be paid to the journal publisher or other copyright holder.

On the output side there does not seem to be at present a major protection issue, largely because users of computerized data bases receive

individually-tailored output, unsuitable for use by other potential customers. Any unauthorized transferral of output copies that might occur is also limited by the difficulty of locating other users who would want the same listings and arranging a transaction with them.

There may be some problem due to another computer operator paying for and obtaining virtually all of a data base, then reselling its contents without incurring the "wholesaler's" set-up cost. This practice is again hampered by the necessarily public nature of marketing computer data bases, and so it is probably not possible to avoid paying fees on a large-scale.

D. PRESENT AND PROJECTED PROBLEMS

In this area present law appears to provide adequate protection for the holders of copyrighted materials. There has been a large amount of discussion within CONTU as to whether computer vendors should be subject to suits against copyright infringement at the point of input of material into a computer or at the point of output to the user. We do not see this as an important point of contention. Regardless of the stage at which protection is formally defined to occur, it is clear that the copyright holders have legal rights in connection to any use that is made of their work, whatever the final form of presentation. Thus, computer vendors would be, as they are now, required to negotiate agreements with the source of copyrighted inputs prior to inputting it for resale to users of the computer service. The terms of such an agreement are a private market matter with no apparent policy implications.

For computer-created works, where the output may be considered a new creative work, and whose value may be dependent in part on one or more copyrighted information sources, the software used to manipulate the data, the hardware and data transmission facilities, and the skill of the retrieval operator, we see no policy difficulties. The rights to any revenues resulting from the newly created work should be allocated by private contractual agreements. In the absence of any rights of the input owners, the owner of the computer operation would retain ownership of the output. If an individual programmer renting computer time, with no strings attached, created such a work, that person would be entitled to the copyright. Other arrangements would again be of concern only to the parties involved. There does not seem to be any reason why works

created with the aid of a computer should not be provided with the same proprietary copyright protection as any other intellectual work. In no case does a computer alone "create"--there are always human authors.

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Our major policy concern is with the existence of monopoly (or monopsony--on the buyer's side) power at any of the stages of bringing computerized information to the ultimate user. Copyright protection is desirable from the standpoint of consumers, assuming effective competition in an industry. It is apparent, however, that there are various degrees of market power among publishers of the input materials, and the data base wholesalers. We do not have the information needed to make an adequate assessment of the current impacts of that power, nor can we project the future of the industry. A detailed empirical analysis should be done of the data base market.

To the extent that firms possess the ability to control prices at any stage of the process, consumers will suffer in the end. This need not require the existence of only one reference source or only one computer service. Because each bibliographic source/data base or computer vendor may offer largely unique materials or services, there may be little effective competition (or substitutability) among them. In such a case each could set a price that would yield some monopoly profit, but not enough to induce a rival to make the initial outlays necessary in effect to duplicate the product of the first. Monopoly power among information sources, for example, would enable them to raise prices to computer data base vendors, ultimately causing increased prices to consumers. Simultaneous market power on the <u>buying</u> side by the computer data base firms would yield an indeterminate arrangement between them, as both sides bargain for the best deal. Consumers would in no way be helped by such rivalry. The conflict would determine only how the monopoly profits were to be divided between the monopolist and monopsonist. A situation, as at present, of strong monopoly on the part of the wholesalers may enable them to force data base publishers out of business, with the latter selling out to the former, causing vertical integration in the industry, thus consolidating the monopoly profits into a single entity. In any case, the consumers of computer data base services are likely to be faced with the standard losses due to monopoly (or oligopoly)--higher prices, reduced supply, lack of responsiveness to consumer needs.

E. POLICY ALTERNATIVES

The relevant alternatives for federal policy towards protection are:

1) Modified status quo--copyright protection for copyrighted inputs and for computer-created works.

2) No protection--neither information sources nor computer operators would have protection available to them.

3) Continued copyright availability for data publishers (sources), but no protection for computer data base vendors.

4) Continued copyright protection for both stages of production. Antitrust action or regulation of prices to be used where appropriate against firms with market power.

5) Public provision of or subsidies for creating some data base systems.

The status quo is adequate if competition remains reasonably effective, but granting the possibility that that will not be the case, it reduces for our purposes to option (4). Both alternatives (2) and (3) are unlikely to have any desirable results for consumers. (2) would require a restructuring of the entire copyright law, as there is no distinction between materials which can be used on computers and other works of authorship, and so no basis for denying copyright protection to that segment of the information industry. (3) might be legally plausible, on the theory that once information is put on the computer its owner no longer is eligible for the standard privileges. It could be argued that denying protection at this stage might enable new entrants to make unauthorized use of the data bases of the dominant firms, enhancing competition in the industry. The probable results of (2) or (3) would not however, be any increase in competition or in the overall availability of data bases. As has been emphasized a number of times, unless the producer can expect to recover at least the set-up costs, there will be no economic incentive for continued production of data bases. In light of the ease of copying (reproducing) a data base, absence of copyright protection would be likely to result in a move towards strict reliance on trade secrecy, no-disclosure contracts, physical protection, and careful limitations on access to large portions of data bases, leaving us with no more competition and possibly greatly increased costs of transacting business.

Instead, for lack of more imaginative solutions, the appropriate response to monopoly is alternative (4) with the possibility of some usage of (5), public support for information services: For a full discussion of these matters, including the optimal pricing scheme under regulation, see Chapter II. G. Regulation and Antitrust Action. There are significant costs involved in any government intervention into markets, and issues of public management and political control involved in choosing the best (or least undesirable) form of involvement; so that pragmatic trade-offs must be made which we cannot evaluate here. As a general rule, however, large degrees of market power do require, in the interests of consumers, public action to break them up or, at least to limit the undesirable consequences of that power.

Our recommendations are:

1) Copyrights should be available for both the information inputs into and the outputs from computerized information systems and other uses of computers to aid creative work.

2) Empirical studies of the structure and functioning of the industry should be initiated, and continuous monitoring of changes should be performed.

3) Federal policies to reduce or prevent monopolistic tendencies--policies analogous to those identified at the end of the preceeding chapter--should be undertaken.

CHAPTER V
FOOTNOTES

1. Conversation with Kathy Ray, Brookings Institution Acquisitions Librarian, April, 1977.

ADDENDUM

DESIGNING POLICY FOR THE FUTURE OF THE INFORMATION SYSTEM

Most of this report has dealt with the attributes and problems of the information protection system under current conditions. However, it is clear that technological changes in various areas, including photocopying, computers, and possibly most important, telecommunications, are likely to have an enormous impact on the workability and desirability of present laws and institutional arrangements. While advancing technology holds out great promise, there appears to be a significant danger that it will be hindered or have its potential uses distorted by the actions of groups with interests in the status quo. In other words, the technological feasibility of new information systems should not be taken to imply their rapid acceptance--there are severe institutional constraints which must be dealt with first, among which the proprietary rights for information producers (copyrights) play an important part. Below we attempt a preliminary exposition of the issues which should be considered in designing a system for the production and dissemination of information that is compatible with the maximum possible benefits that can be realized by the public at large. It is hoped that, although these rough ideas are not central to the basic analysis of this report, they will be useful in stimulating discussion leading to more direct policy implications.

AD-2

I. COPYRIGHTS MUST BE CONSIDERED IN A LARGER CONTEXT

Copyrights, patents, and trade secrets have grown up over many centuries as part of public policy to encourage the production and use of intellectual products. Their scope, terms, administration, and encouragement has been refined and changed as elements, not entities by themselves, of a larger public system of encouraging appropriate flow of information.

As early as the Magna Carta, preservation of copyright was an essential aspect of public life. Guilds were granted royal charters and were supported in their preservation of the secrets of their trade. These grants, patents, and charters were subsidized further by access to the courts for their enforcement.

Early in the life of the American republic there was established an office within the Library of Congress for the registration of copyrights, in a way parallel to the registrar of patents. These offices are subsidized out of public funds. Their purpose is to facilitate the enforcement by private parties of their grants of partial monopoly from the public.

Perhaps the largest expense of the public institutions is involved in facilitating the usage of copyrighted materials--education for general literacy. When extended through general education at the college level it accounts for about $100 billion dollars a year. This expenditure comes out of the conviction that the private market is likely to underinvest in instruction which facilitates, among other things, the usage of intellectual products. The above figure includes $1 billion a year for school texts.

The distribution of intellectual products is also heavily subsidized. A major part of the cost of the postal system is caused by the partial subsidy of rates for books, magazines, newspapers and the like. This is likely to be on the order of several billion dollars a year. Further, usage of the public airwaves for radio and TV is granted without sizable fee to private usage, rights which on a commercial auction basis would probably bring rents of several billion dollars a year.

Production of scientific and technical information, as provided by the general market, has been considered to be insufficient, and public support of these activities through government expenditures and tax write-offs is on the order of $50 billion per year. To this figure should be added the costs of research done at colleges and universities. Much of this support is either direct public subsidy or tax write-offs for donations.

Most companies and government agencies are involved in continuing an adult education and training of their employees. Approximately 9 million Americans are involved in such activities, with an annual cost of approximately $15 billion per year. In addition, the purchase of books and magazines for professional purposes is a tax write-off worth perhaps a billion dollars a year for personal use and $2 billion for private libraries in businesses.

Public libraries, beyond the many found in schools and universities, also obtain their funds from the public, with combined budgets of several billion dollars a year.

Thus, all in all, the annual public expenditure, either in terms of direct public subsidy and support, in terms of rights to the air waves, or in terms of tax write-offs, in the support of the production and distribution of intellectual goods is on the order of about $200 billion. At the same time, the annual payments within the USA for copyright royalties is only a few billions (with a similar amount coming from abroad).

It should be clear from the above discussion that the part played by copyrights in the distribution of royalties for usage is small in comparison with the public expenditure. But copyrights are probably a crucial part of the system in two ways: first, the few percent of the system involved in royalties is discretionary money on top of stable and assured money, and thus attracts unusual attention. Thus, this small amount becomes a steering current for the whole. Second, copyright stabilizes property rights and encourages specific modes of exchange and transmission of the information. For example, even though the same information could be distributed in a Sunday newspaper format for 50¢ (and, if sold for $1.50, earn much more income as an annual piggyback on the usual newspaper) it is easier to control the copyright and to manage arrangements if it is sold as a $500 encyclopedia.

However, there are now emerging new technologies which can revolutionize the structure of the system. Basically, they separate the intellectual content from the carrier medium (the book is a physical item, though it is the content which is copyrighted). By so doing, property rights and dissemination processes can be arranged in ways which are quite different, and perhaps very difficult to manage under old ways which grew up with different technologies.

II. POTENTIALS FOR NEW TECHNOLOGY OF INFORMATION TRANSFER

Let us, for a moment, imagine what could be done with technology which is already available, but configured in a slightly different form to take care of some current needs and usages.

The bulk of this country's population is covered by TV channels, much of which could be piggybacked by a few additional channels at very low costs (using the current towers and transmission stations). If there were only a way to convert written information into electronic form, and then to reconvert it to ordinary page copy, the costs of transmission would be almost zero. One TV channel could transmit the content of the Library of Congress in a week, with the most popular million books being run every day. All the correspondence carried by the Post Office could be transmitted on another channel daily, with enough room to broadcast all the letters, regulations, and other documents in the public domain by the government. The total cost for such piggybacking would be less than 50¢ per citizen per year. Another way of performing the same feat would be via a highpowered TV satellite in synchronous orbit, with similar costs, but probably poorer reception for the moment (this can be fixed soon).

The costs of translating written material into electronic form, or capturing as such in the first place, are rapidly declining. An office-size OCR (optical character reader) which can process electric typewriter fonts is now about $5,000. An experimental library instrument which not only reads books placed on them by the blind, but simulates speech, costs about $50,000 each in prototype; the prices are expected to plummet soon, expecially in versions which do not require special mechanical elements for the blind. Office electronic typewriters are now only a few thousand dollars, and record information electronically in a form which could be transmitted by phone or other electronic media. Thus, these prices are coming down to the level where a system could be begun almost immediately.

The receivers are a little more trouble for the moment. A device which can be attached to a TV set for reading electronic material now costs a few hundred dollars, including keyboard for writing. Like TV games, these costs can be expected to drop precipitously in the next few years. A serviceable paper printer is also a few hundred dollars now, and dropping rapidly in cost.

These devices can be attached to a $20 cassette recorder as a storage medium capable of holding about a book's length of information, or to an $800 TV recorder which can hold about 100,000 books' worth of information.

Thus, for homes and offices equipped with devices as costly as a color TV set, the possibilities exist now for inexpensive information transmission. These devices can be hooked up to the telephone system immediately without waiting for any large scale conversion. The costs for coast-to-coast correspondence is now about the cost of first class postage. In a few years is should be much less.

By using an OCR at the office and then in the home systems, a group of friends could use a chain letter method in a way very similar to samizdat of Soviet dissidents to distribute a copy of a new book across the country to 1000 others for a communications cost of about 5¢ per person, given that non-mass market book readers tend to be concentrated in metropolitan areas with toll-free telephone rates. With such systems around, copyright as we know it will be unenforceable.

Thus, for a cost of only a few billion dollars a year to all parties concerned, the present library system, Post-Office correspondence system, and government information systems could be replaced. If there is not such a shift in usage, there will be strong incentives to evade current institutions using private systems.

Before getting into the institutional problems more deeply, it may be worthwhile to point out some other technologies which might have some impact.

While the TVR (such as the BetaMax) has the capacity for large scale evasion of current institutional arrangements, the Videodisk could be used for large scale decentralization of archives. The marginal cost--that is, the cost of making an additional copy once the material has been put into electronic form--of storing the contents of all of the libraries in the world in a stack of videodisks is now about a thousand dollars; in a decade it could be about the current cost of an encyclopedia. If it were offered, many graduating high school or college students would want one.

A satellite in synchronous orbit could beam the content of all the world's printed information to all the world's peoples. This would not only speed up the intellectual development of developing countries, but would make censorship and intellectual repression very difficult. The long-range consequences for world peace might be enormous.

BD·6

TV and other broadband communications present a much greater problem. The bandwidth required by TV for the same time-usage by humans is millions of times greater than for writing. But this problem can be handled by placing a larger satellite in orbit. An array of antennas about a mile square could pinpoint a message to any place on the earth's surface electronically (by using phase differences in transmission from different parts of the array, a place a hundred yards away would receive many millions of times weaker signal). Thus it could beam many billions of channels of information down to the earth, but with some requirement for switching instructions from the user--one can order several channels with a few seconds' delay before delivery. Thus any small area could have its own unique channel. The practical and cost-effective implementation of this idea is perhaps a decade away, but it is worth moving towards.

Privacy can be maintained in such systems by use of inexpensive microprocessors and sophisticated coding systems. Thus private post can be distributed to someone's code number. While a very large computer could probably decipher the message it would be costly, and would take special effort just as information can be intercepted now by special effort and expense. Such codes and ciphers could be used to protect private postage or copyrights in such a system, but in ways and with a logic quite different from protection based on possession of a physical carrier. It may well be possible to arrange actual usage to better reflect needs for information and intellectual products.

In a purely electronic information system, the essential requirements for use of a product is knowing where to find it (its "address"), and knowing the code cipher required to decode the information ("access"). These correspond to possession of the physical carrier, and knowing the language in which it is written, respectively. Restrictions of use to those who would pay is based on different principles: In the physical, material form of distribution, control is based on being able to spatially lock up the carrier, the effort and costs required in carrying it off and in reproduction. In the electronic form, it is based on the intelligence, time, and attention required to find and decode the content.

A reference to an article, an enjoyable book or picture can be passed on to a friend or colleague very easily when the address and access are pure information themselves. This kind of diffusion can be realistically controlled in four ways:

(1) Tie the information to a physical location either of use or access. AD-7 Thus the information or enjoyment is tied directly to some physical transformation which is itself controlled by other factors. This is a point of implementation, and may well be tied into some societal economic or cultural system. Information of this kind may be likened to the category of trade secrets, and the controls which would evolve would be a generalization of the experience there.

(2) Protect the distributors from other public and overt purveyers, and allow them to try to regain their investment before private diffusion has depleted their market advantage. Expressive literature which builds on fad and fashion and so has a limited lifetime would fall under this category. The protection and experience is most similar to traditional copyrights. What would not easily be protected in a new electronic environment would be those rare classics which have universal appeal and applicability and yet long drawing power over the years. However, there is little evidence that such are any more predictable or encouraged by long-term commercial benefits than short-term expressive products. Indeed, in the scientific and technical experience, such ideas are often held not to be patentable or copyrightable.

(3) Target the information so that it is especially valuable only to a small or limited audience which is predictable ahead of time. This type of product is most similar to that protected by the patent system. There is a sense of specific value added in terms of building on previous factors of production, and having a predicted audience or clientele in mind, with some relatively specific sense of value added for that clientele by use of the information provided. Usage of the information can be protected if the who and what of the usage is predicted in advance, just as in the case of patents. This mode of operation is also similar to the practice in the scientific literature: it is expected that users of ideas exercise due diligence in searching for antecedents, and that they give due credit and citation to those which they find; failure to do so may result in partial exclusion from that community, or in job sanctions. Positions, promotions, and prestige are allocated in large measure based on who cites and uses one's ideas, and with what further benefits.

(4) The information is individualized in the sense that there is interaction between the purveyer--who has in stock many ideas, processes, or

tools, and the client--who has a problem or need, but is not sure of exactly what is needed or available. The heart of this process is a series of interactions out of which the two develop a better model (diagnosis) of the situation, and a sense (prescription) of what will work. In the personal sphere, this is the action of a professional or practitioner such as a physician, lawyer, or teacher. In the new technological areas, it is the function of a data-base purveyor, or modern librarians. The value added in the client's situation is the administration of a specific recipe (Rx), and the improvement experienced. But there can be purveyors to the professional or practitioner, too. This would be in the form of better diagnostic tools, and better information stocks (recipes) for application; these products are in the form discussed under (3) above. To complete the model, the products listed under (1) above are those supervised by pharmicists or therapists; those discussed under (2) above are "patent medicines" sold over-the-counter, with a strong expressive or psychosomatic aspect. The area of (4) is generally controlled by licensure.

Thus, the potential effect of the new information technologies is to facilitate the on-going shift from mass-media intellectual products which tend to aim at the median audience very efficiently, but are much more costly, or less well adaptive, for smaller groups.

The overall direction which seems to come out of the considerations sketched above is better and more timely adaptation of information and services to individual need and situation. But this process is dependent upon the retrieval of appropriate information, or upon the prediction of where the intellectual product is likely to find use. This then focuses attention upon the modelling and switching capacities of the system, or upon the computer use patterns. Since the principle value added comes from the timely individual adaptive or accurate model, there will be a tendency for the basic content of the system to be not the final display product to an individual, but rather the program which generates the display. Since this is a rather different concept from current perception, let us discuss possible examples or viewpoints of this idea, and then discuss the technological potentials and principles behind it.

As an immediate example, we can take the individualized book. Already, one can buy for very little additional cost, a children's book which has been computer-printed with the child's name in it, together with names of

local towns, streets, dogs and cats. In the practice of programmed instruction, it has been found that about 15 to 20 students will provide about 95-98% of all the questions and difficulties in mastering a particular article, and that it is possible to provide answers and assistances which will allow almost all to master the material; unfortunately, it takes about 5 times as much space to provide all the extra materials, and a lot of students are bored if they have to slog all the way through. Thus computer assisted instruction, in effect, attempts to individualize the material so that each student only sees that part of the material needed, and yet get a much higher fraction of the students through-- at sizable economic savings in terms of cost-effectiveness. It is reasonable to expect that similar principles could be applied in expressive literature, with the turns and pacing of the plot adaptable to individual temperaments of the readers, with much greater psychological satisfaction. Thus, in this case, we can see a possible trend: books initially were in category (1), with the Gutenberg Bible highly illustrated so that the book was a sumptuous physical instrument itself. Then came the invention of the novel as an instrument of mass expressive appeal, and with almost all quickly passing out of fashion into oblivion, per category (2). With better information on clienteles, fiction and literature has been focused, for example, for specific set of Zip Code residential areas, or even individualized to specific households based on a list of 50 common names used in the area (the local dogs and cats of the example above). It is now becoming possible to develop interactive computer programs which present in effect an individualized book depending upon the instantaneous mental state of a particular person.

The availability of technology, or the size of the market, while classical economic prerequisites to the potential improvements sketched in the evolution above, are not sufficient. Also important has been the development of better information on current situations, and better models for predicting likely outcomes. Thus, in the case of programmed books, as above, or in the corresponding medical case of models of clinical judgement which can in some instances out-perform on a more reliable basis ordinary physician diagnosis from a slate of test results, the situation requires good information about the very large range of potential customers or users, and well-developed computer models which predict with some reliability the

benefits the clients are likely to gain. These informations and programs become factors of production behind the final application, and themselves become economic commodities.

As a second example, consider the evolution of computer programming. At first, and still to an uncomfortable degree, programs have been somewhat specifically tied to particular machine configurations (category (1)). But rapidly changing technology with the manufacturer's needs to update the machines without recurring software expenses, the demands by customers to have new machines without further software costs, and the ability of machines to simulate each other's operations all tend to make software ever more machine independent.

Quite a few specialty programs have been developed as part of the marketing strategy of computer companies to establish visibility, to break into a new market such as accounting systems, or general purpose graphics packages (category (2)). Major houses have also developed detailed packages to entice specific clienteles, with large and especially developed software under trade-secret or patent protection. But there has been continued competitive pressure to make the programs modular in format so that many companies can participate in suggesting new improvements without the need to develop a whole new system. This is similar to the forces which act to keep major industrial labs publishing their general research, while keeping their applications to individual internal company problems secret. Thus, the market has tended to bifurcate into two major categories: very large and complex programs affordable only by the largest of companies in specialized international competition; and, a generally open market of sub-programs which is hovering between the ethical product mode of (pharmaceutical) distribution, and the scientific model of open dissemination for visibility and prestige. Given the preceding analysis and experience from similar areas (together with the ability of machines to mimic each other) it seems likely that the second model will emerge for the factors, with the pharmaceutical mode merging into the practitioner mode (category (4)). There are some preliminary indications that procedures and models for operating the practitioner mode are beginning to diffuse.

In these several examples we have seen at work a classical pattern in the shift in the texture of a market area. It starts out with individual craftsmen or artists employed by a wealthy patron to use some expensive

material or technology to achieve some effect (frequently spectacular or monumental) on the particularities of the patron. There is a long-range shift of the system to involve the participation of many diverse specialists handling portions of the problem using smaller, cheaper, and more easily distributed materials in ways which can be combined in predictable ways to meed differentiated categorical needs by individual consumers. Since the practitioner portion of the system is crucial for information implementation, the system could be organized in a highly decentralized manner; since the carrier for the information is a prerequisite, it could also be organized around several large providers of that service; the choice is partly a matter of public policy. AD-11

Which would be the likely final mode of economic organization is not easy to predict because of the possibility that models of practitioner judgements may not themselves become a market, but may be highly centralized. The bases for such centralization would be derived from advantages of central collection of data from a very wide range of users (and thus, greater reliability of models), the likely continuing economies of scale of super-large central computers, and from the scarcity of highest creative talent in the generation of new insights. But as a matter of public policy it may be possible to provide some of these services in a disaggregate or common carrier mode, or to encourage the most creative people to take academic or government lab positions as contributors to the externalities of smaller-scale situations.

It should be possible to develop an experimental set of different arrangements, with analysis of the data using both psychological and economic models. The above discussion brings out that the central factors permitting enforcement of ownership or attribution of creations depend on factors of learning psychology, and of the value added through better prediction; both of these areas have theoretical models which would facilitate the analysis. Let us for a moment highlight some of the principles involved.

One of the central results of learning psychology is that learning and utility of information is only secondarily based on the availability of the information: people are surrounded by far more data than they can ever hope to absorb or use. The critical factors are:

a. Motivation--which is based on a reasonable experience or expectation that the data will be useful in obtaining some satisfaction or speeding up some previously learned operations.

b. Timely appropriateness--the information fits into some motivated scheme of operation in current effect. The information must be formulated to be absorbed easily into that scheme, and must arrive or be easily retrieved when needed; if either condition fails, the information will be almost useless.

c. Frustration--if the costs or efforts involved, or the timing is off, the futilities may outweigh the utilities and the whole scheme be abandoned or put off. Thus the pattern of interaction is critical, and a major aspect of the purveyence of information is the scheme of presentation, and how well it matches the needs of the client.

This psychological model (derived from Pribram's research on brain functioning, as well as the work of Piaget and Bruner) emphasizes the matching of schemas of client operation and supplier presentation in time as well as effect. From the perspective of economics, the problem of the supplier is that of formulating a scheme from past factors which he can reasonably predict will be recognized as useful by a predictable client and at a predictable time. Thus, his production function contains the following components:

a. prediction of a distinguishable or cheaply recognizable schema in operation at a particular time, place (at least in the space used by the retrieval system);

b. reliable availability of schemas which can be compounded together to provide the client's needed schema.

The situation is complicated or enriched by a number of other aspects. The schema "for sale" can become more valuable (better adapted to an individual user, or resulting in less futility) or of wider appeal (adaptable to a wider range of users) if it is constructed in ways which make it changeable during usage; thus, if it is not a static presentation, but one controlled by an intelligent program (another schema!) it becomes more valuable. Information on the behavior of clients, when organized in ways which match the schema of adaptation of the supplier also can become a factor of production. But these kinds of functional distinctions between different kinds of factors are familiar to economists, and are susceptible to analysis.

In summary, let us highlight the following points:

1. Beyond the arrival of cheap reprography (one in every home) there is another technological revolution now available which can change the economic and enforcement configurations radically, and essentially eliminate most distribution and printing costs.

2. There are still enforcement and economic considerations which revolve around classical problems of utility (psychological satisfaction) and predictability (economic value-added). It should be possible to arrange a system which can resolve the fine details of individual utility, and provide far greater general predictability, or more rapid evolution of appropriate services. There are pregnant models to extrapolate from.

3. As examples, a new system could focus on: reliable improvement in the operation of particular physical situations, with known measures; timely provision of services in a mode conducive to expressive expectations; predictable suggestion of information for specific situations which would be monitored not on the basis of examining the information (royalty for purchase of access to content) but on actual use (when the result comes out as predicted, as with patents); and individualized services based on maps of needs and abilities.

III. DRAWBACKS TO THE EXISTING INFORMATION SYSTEM

Below we point out a number of what are (from our viewpoint) undesirable aspects of the existing information production and distribution system. While there are a number of factors interacting to determine the structure of this system, the copyright law is an important feature in the overall result, and will become of increasingly greater importance as the availability of new technologies puts strains on the system.

The total costs of operating the system are high and growing at a rapid rate, making it difficult for the various modes of information dissemination to function effectively. For example, libraries are facing skyrocketing costs, (10 to 15 percent per unit of service per year), due both to increases in purchase prices of books and journals and to the hidden, but high, costs of operating a circulation system, meaning primarily personnel costs. Textbooks, particularly in the upper levels of the educational system, are steadily being priced out of usage, with increases of 7 to 10 percent per page per year. The postal system is another example where the expense of

handling information transfer via obsolete methods is showing up in unmanageable cost increases of 10 to 15 percent per year. With library and postal service budgets not receiving corresponding increases, services to consumers are being cut back.

The high setup costs of initially putting together an information package and setting up a distribution system greatly limit the range of information which can achieve wide dissemination. For books, journals, television, etc., despite the relatively low costs of serving the marginal consumer, it is very difficult for information producers (authors, prospective writers of TV shows, etc.) to obtain space in the media. The middlemen between information and entertainment creators and the consuming public--publishers and broadcasting networks--in attempting, due to the pressures of the system, to serve the widest possible audience and thereby minimize their risks and maximize expected revenues, strongly influence the communications channels towards serving only what are perceived as the predominant tastes and needs. Consequently, the incentives for authors are to innovate only in certain narrow directions, for otherwise the odds are overwhelmingly in favor of their being shunted aside in favor of the "mainstream" trends of expression. There are strong tendencies towards development of a "monoculture" as the diversity of local and regional cultural traits are absorbed and eliminated by pressure towards a uniform center. In general, the highly centralized form which modern communications mechanisms have taken is a great barrier to variety of expression and informational content.

- Consumers of information have very poor product data on which to base their purchasing choices. The channels for evaluating information sources prior to purchase are limited and ineffective, but payment must be made at the point of access to the material, not according to the utility gained as the result of usage. Purchasing decisions are made according to such uncomprehensive, unreliable means as friends' recommendations. Choices are highly susceptible to product promotion--seller type--and often tend to be faddish, responding to recent influences.

- The centralizing tendencies of the information content also encourage increasing concentration in the control of information flows, as the "middlemen" industry tends toward greater degrees of monopoly. For example, the evident trend towards reduction of competition between newspapers in any local area, and the growth of large newspaper chains across the country.
- The commercial, monetary reward structure of the copyright system tends to drive out production of information--based on other incentives. In academia, research and publication of scholarly papers is based on securing one's tenured position in the academic world, and on rewards in the forms of renown and recognition. But for the publishing of textbooks, of the materials needed for the crucial function of educating students, there is very little in the way of status in the scholarly community involved, but rather the hope of substantial monetary gain. As a result only a very small portion of the eminent people involved in the various academic fields put time and effort into textbook writing, despite its obviously determining impact on the quality of education. Moreover, the previously discussed high setup costs of production and distribution cause a centralizing trend in the content of texts. It is clear that much greater variety, detailed explanation, and separation of texts into modular units is needed to serve the needs of individual students but under the present distribution system this appears to be economically unfeasible.

  Similar difficulties due to the effects of monetary incentives exist in other fields of creativity, such as for artists and mass-market writers. The necessity for publishers to advertise and promote in other ways the most popular "mainstream" works tends to drive others out of the market, or away from public attention.
- The system by which "free" television and radio, and other media, are paid for indirectly by advertising has well-known but nonetheless drastic effects on the quality of information and entertainment presented, on the product choices made by consumers outside of the information market, and on the general cultural

and other basic features of society. Due to the indirect means by which, in effect, the publishers of mass media programming are paid for their work, consumers are induced to absorb highly persuasive advertising along with their entertainment, and the programming itself is designed to be compatible with and enhance the desired effects of the advertising.

IV. SHORING UP THE OLD SYSTEM VERSUS NEW DIRECTIONS

As new technologies begin to impact on the preexisting system of protection for copyrighted works there are basically two approaches which can be taken by public policy. Attempts to "patch up" the current methods, principles, and procedures so as to accommodate new developments within the general framework of existing institutions and laws are possible; or systematic exploration and experimentation with substantially new concepts for regulating the dissemination and usage of information can be made. Marginally amending the present system will only hinder the advent of new technologies which hold great promise. Instead experimentation with common carriers for the transmission of information, with alternative payment mechanisms, and with reliance upon non-monetary incentives should be instituted.

Insistence on using a patchwork is likely to lead to one of two possible results. First, a constituency may arise with a strong vested interest in the institutional arrangements which are solidified by marginal changes in the laws. Through politicized governmental regulatory activities, the constituencies will maintain their economic interests at the expense of society's interest in implementing technologies with vastly greater efficiency in information transfer. Also, the possibilities for creative construction of new institutional arrangements will be greatly restricted. Second, if and when powerful new technologies force their way upon the system despite the efforts of groups with commitments to present structures, it is likely that costly disruptions and sub-optimal changes will occur during the transition period, which could conceivably drag on for some time due to political maneuvering.

In either case, it is important to (for once) recognize the implications of technological change, and to anticipate the needed rearrangements

of economic and social structures. While there may be uncertainty and dangers in regulating for the future, a systematic exploration of the various options which may be open to society to make most effective use of its opportunities is certainly preferable to stagnation with the status quo.

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